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Edson's Recording Steam Gauge.

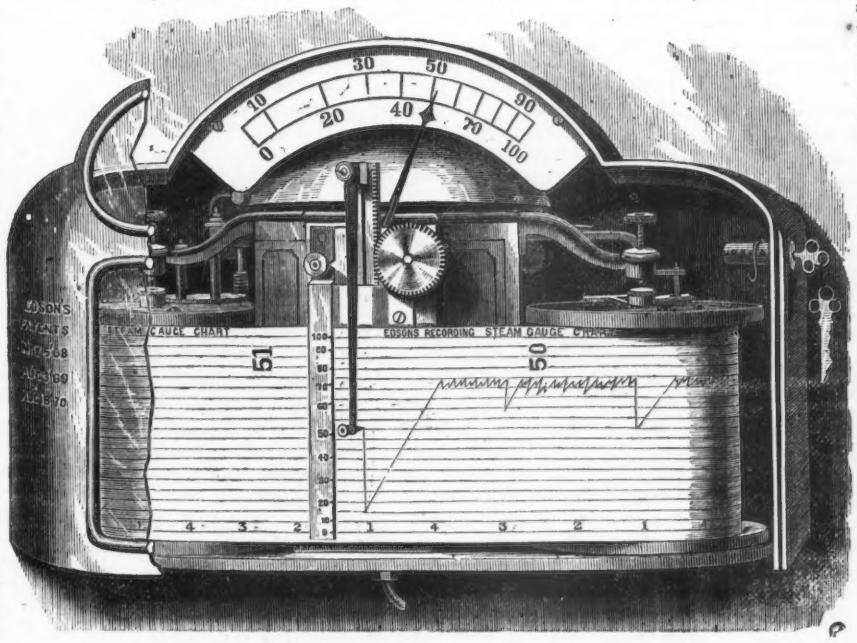
THE practical utility and value of this device for recording accurately and automatically the condition of the steam-pressure in a boiler require only that attention should be directed to them to become apparent. We naturally feel more implicit trust in an automatic machine, that cannot go wrong without unmistakably showing the defect that caused the error, than in even the most reliable observer; but when in addition to this the machine is at the same time continually operative and also permanently records the observation, the immense advantage must be seen at a glance.

The inaccuracy of observations of the phenomena of nature, such as the temperature of the atmosphere, the state of the tide, height of the barometer, etc., has led to the almost universal adoption of automatic machines for such purposes. A story is told of an eminent professor who personally made careful observations of the weather, which he published, directing particular attention to the sudden and violent changes which had taken place during a certain season. The theory advanced to account for the changes was most scientific and ingenious, and doubtless cost many hours of careful study for its elaboration. Unfortunately, however, it was discovered that these sudden and violent changes had occurred during the summer season, when the roof of the college, where the observations were made, was a favorite resort of the students, and hence the accuracy of the observations began to be doubted by some, notwithstanding the reputation of the professor and the ingenuity of the theory. The most desirable method of making any observations, is by the use of automatic apparatus, which may be securely locked up, and thus kept out of harm's way. If our professor had adopted such a system, there is but little doubt that his results would have been different.

The frequency of boiler explosions has given rise to many theories, a great deal of talk, an immense amount of suffering, considerable loss of life, and but few results of any scientific or practical value, except that without doubt the most prolific source of all these disasters was the culpable neglect and carelessness on the part of those in charge.

The device of Mr. EDSON, if attached to a boiler when it exploded, would perhaps be blown to pieces, but it would, nevertheless, in all probability leave on record the increased pressure that caused the explosion. It furnishes a constant check upon the actions of the engineer and fireman. By means of the lock and key shown on the right hand side of our engraving, the gauge may be locked so that it cannot be tampered with. The indicator is connected with the boiler by means of a pipe which allows the pressure of the steam to act continuously upon a series of pairs of corrugated steel disks, which are expanded by it. This expansion gives, by means of a lever, a rotary motion to the tooth-wheel shown in our engraving. This wheel working in the rack, raises the pencil and gives an upright stroke upon the paper. During this operation the paper remains stationary, but when the pressure falls the corrugated disks contract, the pencil receives a downward movement, while at the same time, by means of a lever and pawl, a rotary motion is given to the drums around which the paper is wound, and hence the pencil makes a diagonal downward mark, as shown in our engraving. By the side of the pencil is placed a scale for convenience in noting the changes of pressure, and for the sake of convenience the chart is divided into sections, denoted by the numbers 50 and 51 shown in our engraving. A single roll of paper will last for several months, and may then be filed away for future reference. Above the paper will be noticed the dial and indicator-hand, which is the equivalent of the ordinary pressure gauge. By means of another attachment, an alarm gong is sounded whenever the pressure exceeds a certain maximum, which may be fixed at pleasure by the inspector or whoever is in possession of the key, but cannot be altered by the engineer. The ringing of the gong continues for a considerable time, or until the apparatus is re-set, for which purpose the key is required.

The instrument is adapted for use on locomotive, stationary or marine boilers, and may be used either for high or low pressures. The working parts are nickel-plated, so as to effectually prevent rusting or corrosion. The manufacturers are the Recording Steam Gauge Company, No. 91 Liberty street, New York, from whom further particulars may be obtained.



EDSON'S RECORDING STEAM GAUGE.

Mont Cenis Tunnel.

THE great tunnel under the Alps is a work altogether exceptional, says Professor ANSTED, being the first instance of the perforation of a great mountain axis; the first in which an important tunnel has been attempted exclusively from the two ends without shafts; the first in which the ingenious machinery for boring the rock preparatory to blasting has been carried into effect. This tunnel, 40,094 feet in length, is likely to supersede all other roads, and convey a vast number of passengers and goods through, instead of across, the great natural barrier which the Alps present between Northern and Southern Europe. Much has been recently said about other Alpine tunnels, but none has been seriously undertaken; nor, in the present state of political affairs in Europe, is any likely to be commenced for some time to come.

It passes under the Mont Frejus, about sixteen miles west of the Mont Cenis and the pass known by that name. It is therefore very incorrectly termed the Mont Cenis tunnel. It cuts through the watershed of the Rhone and the Po, which, in this part of the Alps, is a crest varying from seven to ten thousand feet above the sea. Mont Tabor, the highest part of this crest, is a few miles to the west of the tunnel, and is 10,430 feet above the sea, while the Mont Cenis pass, the lowest point, is about the same distance to the east, and is 6,890 feet above the sea. The height of the observatory on the summit of the ridge over the tunnel is 9,676 feet. The levels of the valleys to the north and south of this crest or watershed are respectively 3,612 and 4,380 feet. This difference of level, upwards of 750 feet, by which the valley on the south or Italian side exceeds the northern or French side, would seem at first sight to offer some difficulties in constructing the tunnel, especially if much water had been met with. By taking advantage, however, of the form of the valley, the railway is carried by a zigzag on the mountain-side, to some hundred feet higher level before entering the mountain on the French side, reaching the entrance of the tunnel at 4,046 feet. There thus remains a difference of 334 feet, which, when distributed over the seven and a half miles, is found to be equivalent to a gradient of forty-four feet in a mile, or one in 120. The central part of the tunnel is about 5,546 feet below the observatory on the summit, and 4,130 feet above the sea level.

The tunnel, in course of construction not more than twelve years, had been suggested so long ago as in 1841, in a pamphlet published at Lyons, by Signor MEDAIL, of Bardoneche. This pamphlet was brought under the notice of CHARLES ALBERT, at that time King of Sardinia, in whose dominions were included the whole valley of the Arc, as well as both sides of the mountain crest. The work was thus from the first exclusively Italian, and France only became interested in it when it took possession of Savoy. The work has been carried on throughout from both sides by Italian engineers, according to the terms of the treaty by which Savoy was ceded to France. The King referred the matter to the Minister of the Interior to make due inquiries, and the engineering and physical questions involved were submitted to the consideration and judgment of M. MAUS, a Belgian, who was engineer-in-chief of the Turin and Genoa railway, then in course of construction, and Professor SISMONDA, a very eminent geologist, employed in the preparation of a geological map of Sardinia, since published. These two gentlemen, after visiting and carefully examining the whole of the chain between Mont Cenis and Monte Ginerva, reported favorably of the line selected by M. MEDAIL, which was ultimately adopted. The matter then went into the hands of other engineers; but, as on further investigation and calculation, based on the rate of progress of similar works already undertaken, it was estimated that at least thirty-five years would be required for the tunnelling, even if no unexpected difficulties and no accidents supervened, it was natural enough that the government should pause before deciding on a work of such magnitude entirely for the benefit of a future generation. Then came the question whether by some mechanical contrivance it might not be possible to accelerate the progress. It was soon found altogether out of the question to attack the tunnel at any point between the two extremities. In most cases when railway tunnels are required, a shaft or many shafts are sunk from the surface, and the work goes on from each shaft towards both ends, at the same time that the two ends are being driven. In this way, by means of two shafts, a tunnel of three miles might be divided into six sections of a half a mile each, and so in proportion. But in the case before us, the height of rock above the tunnel would be as much as 1,500 feet at a distance of less than half a mile on the Piedmont side, and almost as much on the Savoy side. To sink two shafts to a depth of 1,500 feet in an Alpine country, and after all leav an interval of more than six miles, was not to be considered for a moment. The whole distance (7½ miles) must therefore be pierced from the two ends. A machine was contrived by M. MAUS which, taking advantage of the water-power abundantly available on both sides of the mountain, was expected to reduce the time required for the work by one-fourth; but owing to the political events of 1848, this machine was never actually put together and used. After the disturbed times had passed, and when Italy became a kingdom, the engineers charged with the execution of the work had perfected the ingenious and most effective machinery that has since been used for perforating the rocks. Some time of course elapsed before operations could be carried on with steadiness and vigor.—*American Exchange and Review.*

Monster Specimen of Gold Quartz.

THE geological cabinet of the U. S. General Land Office, has just been enriched by a valuable mass of quartz rock containing gold, forwarded by Mr. C. H. CHAMBEBLAIN, U. S. Receiver, San Francisco, California. It was mined in the "Washington" mine, situated in the Julian District, San Diego, County T. 13 S. R. 4 E. *B.* B. M., California, and was brought to this office by Captain JOHN MULLAN. Small hand specimens of this mineral combination are not unusual, but one so large and rich in the precious metal is seldom met with so far from the mining centres. It is thickly filled with free golds in fillaments, leaves and apparently in crystalline grains. The quartz is slightly talcose and is shaded here and there with bluish sulphurets, mostly of silver. A. R. R.

A Steam Canal Boat.

A CANAL boat, propelled by steam by means of a screw placed at the bow, has been tested on the Erie Canal with satisfactory results. The action of the screw on the trial has been found to draw a curent into the opening at the bow, force it along under the bottom, and replace it at the stern, thus allowing the boat to glide along without making any commotion in the water. Among the advantages claimed for it are: that a loaded boat can be run 72 miles per day on one ton of coal costing $5, while the towing for horse boats has cost 40 cents per mile this season, or $28 80 for 72 miles; that the boats can be run twice as fast as the ordinary canal boats without any injurious action on the canal banks; that it can go through a lock in one-half the time that a loaded horse boat takes; that such a boat can go on the canal, river, or lake with her own steam, and so dispense with all charges for towage; and that, if desired, this boat will tow one or more loaded boats at a moderate rate of speed. A great deal of ingenuity has been expended in unsuccessful efforts to apply steam as a motive power on canals,

On the Heat Developed in the Combination of Acids and Bases.*

By THOMAS ANDREWS, M.D., F.R.S., Hon.F.R.S.E., Vice-President of Queen's College, Belfast.

IN a paper communicated to the Royal Irish Academy in 1841, I gave an account of a large number of experiments on the heat disengaged when acids and bases, taken in the state of dilute solution, enter into combination, and when bases, insoluble in water, are dissolved in dilute acids. The following general conclusions or laws were deduced from these experiments:

LAW 1.—The heat developed in the union of acids and bases is determined by the base and not by the acid, the same base producing, when combined with an equivalent of different acids, nearly the same quantity of heat; but different bases, different quantities.

LAW 2.—When a neutral is converted into an acid salt, by combining with one or more atoms of acid, no change of temperature occurs.

LAW 3.—When a neutral is converted into a basic salt, by combining with an additional proportion of base, the combination is accompanied with the evolution of heat.†

Three years later, I laid before the Royal Society of London the results of an experimental investigation of the heat developed when one base is substituted for another in chemical compounds. The law deduced from this inquiry is implicitly involved in the foregoing, of which it may indeed be regarded as a necessary consequence. It was enunciated in the following terms:

LAW 4.—When one base displaces another from any of its neutral combinations, the heat evolved or abstracted is always the same, whatever the acid element may be, provided the bases are the same.‡

Finally, the law of metallic substitutions, first announced in the *Philosophical Magazine* for August, 1844, was then stated in a paper published in the *Philosophical Transactions* for 1848.

LAW 5.—When an equivalent of one and the same metal replaces another in a solution of any of its salts of the same order, the heat developed is always the same; but a change in either of the metals produces a different development of heat.

In 1845, a paper appeared by GRAHAM on the heat disengaged in combinations, the second part of which refers to the heat produced when hydrate of potash is neutralized by different acids.‖ The results arrived at by this distinguished chemist exhibit a close agreement with those contained in my first communication to the Royal Irish Academy.

The concluding part of the elaborate memoir of MM. FAVRE and SILBERMAN on the heat disengaged in chemical actions is chiefly devoted to the same subject. A large number of experiments are described, which are nearly a repetition of those I had previously published. Their results bear a general resemblance to those given by myself in 1841; but they widely differ in the details. The authors of this able memoir fully recognize the accuracy of my fourth law, which asserts the equality of thermal effect, when one base is substituted for another. "M. ANDREWS," they observe, "avait en effet établi que, quelque soit l'acide d'un sel la quantité de chaleur dégagée par la substitution d'une base á une autre pour former un nouveau sel est la même, lorsque l'on considère les deux mêmes bases."¶

In a preceding paragraph of the same memoir, the authors object to what they conceive to be my first law, and state that it is not in accordance, with the results of their investigations. As the question is one of some importance, I may, perhaps, be permitted to quote the passage in the original language. "Ses conclusions, savoir: que la chaleur dégagée par l'équivalent d'une même base combinée aux divers acides est la même, ne s'accordent pas avec les résultas de nos recherches, et ne nous paraissent pas pouvoir être admises." No doubt, through inadvertence, MM. FAVRE and SILBERMANN have here given an inaccurate statement of my first law. It did not declare that precisely the same amount of heat is disengaged by all the acids in combining with the same base, but that the heat is determined by the base, "the same base producing, when combined with an equivalent of different acids, *nearly* the same quantity of heat." A comparison of the results of MM. FAVRE and SILBERMANN with those in my original memoir will show that I had fully recognised and described the deviations from the other acids, exhibited, on the one hand, in excess, by the sulphuric acid, and, on the other, in deficiency, by the tartaric, citric, and succinic acids. "If we refer," I remarked, in the original memoir, of 1841, "to the first, second, and fourth tables, as being the most extensive, from the large number of soluble compounds formed by potash, soda, and ammonia, it will be observed that the sulphuric acid develops from 0.8° to nearly 1° more than the mean heat given by the other acids; while the tartaric, citric, and succinic acids fall from 0.4° to 0.55° short of the same. A minute investigation of the influence of the disturbing sources of heat will, no doubt, discover the causes of these discrepancies. The high numbers for sulphuric acid are probably connected with that acid's well-known property of developing much heat when combining with successive atoms of water. All the other acids develop nearly the same amount of heat in combining with the same base, the greatest divergences from the mean quantity being, in the case of potash, +0.24° and —0.12°; in that of soda, + 0.26° and —0.14°; and in that of ammonia, + 0.17° and —0.05°. These differences are almost within the limits of the errors of experiments."*

But although there is a superficial agreement between my original results and those of MM. FAVRE and SILBERMANN, they will be found, when examined closely, to differ widely in detail, and on points of great importance. I had found that the oxalic acid disengages almost exactly the same amount of heat in combining with the soluble bases as the hydrochloric, nitric, and many other mineral acids, and this observation I have always regarded as one of the main foundations of Law I. MM. FAVRE and SILBERMANN, on the contrary, have inferred from their experiments that "the following organic acids—the oxalic, formic, valeric, and critic—disengage sensibly the same quantity of heat, but it is less (plus feeble) than that given by the foregoing mineral acids"—among which they enumerate the nitric and hydrochloric. According to my experiments, no distinction of this kind can be admitted between acids derived from the mineral and organic kingdoli, inasmuch as the oxalic acid develops at least as much heat in combining with the bases as the hydrochloric, nitric, and several other strong mineral acids.

The experiments to be described in this paper were made some years ago, but their publication has been deferred from accidental circumstances. I have, however, recently repeated a few of the more important of them, with a slightly modified form of apparatus. The solutions were taken in so dilute a state that the heat disengaged never exceeded 3.5°C. A standard solution of sulphuric acid was prepared and carefully analysed, by precipitating a given weight with a soluble salt of barium, and weighing the sulphate of barium. The strength of the alkaline solutions was adjusted with great care by means of this standard acid. The same solution of each alkali was employed in all the experiments, and the quantity used in each experiment was determined by careful weighing. The acid solution was of such a strength that, after being mixed with the alkali, an excess of two or three per cent. of acid was present. The alkaline solution was contained in a light glass vessel, in which a large platinum crucible holding the acid was carefully floated. By giving a rapid rotation, by means of a light stirrer, to the acid solution in the platinum crucible, a perfect equilibrum of temperature was soon established between the two liquids. The initial temperature of the solutions was usually about 1.5° below that of the air, and the final temperature of the mixture about 1.5° above it. The corrections for the heating and cooling action of the surrounding medium were determined with great care. The mechanical process of adding the acid to the alkaline solution produced no change of temperature, and as the heat disengaged in the combination raised the liquid almost instantly to the maximum temperature, the whole correction required was for cooling. The first temperatnre was read one minute after the addition of the acid to the alkaline solution, the mixture being stirred the whole of the time. If δ represents the correction, and ε the excess of temperature above the air in centigrade degrees, the value of δ will be given by the following expression:

$$\upsilon = \varepsilon \times 0.012°.$$

As a proof of the accuracy of the method of mixture adopted in this inquiry, I may mention that, being desirous to know whether the dilute acids employed in these experiments produced any change of temperature when mixed with water, I made the experiment with nitric acid by the method just described, substituting water for the alkaline solution, with the unexpected result of a fall of 0.01°. On varying the conditions of the observation, so as to obtain a larger effect, it was ascertained not only that a dimunition of temperature had actually occurred, but that the observed fall represented approximately its true amount. When hydrochloric acid of equivalent strength was diluted to the same extent, an elevation of temperature of 0.05° was produced.

The accuracy of experiments of this kind, where the whole thermal effect observed amounts only to 2° or 3°, depends greatly on the thermometer employed. Unless its indications are perfectly trustworthy in every part of the scale, the labor of the inquirer will only end in disappointment. I have, therefore, taken every precaution to secure this important object. The tube of the thermometer was calibrated and divided with care, according to an arbitrary scale, by means of a dividing instrument contrived for the purpose, and provided with a short screw of great accuracy made by TROUGHTON and SIMMS. The divisions, etched finely on the glass, corresponded to about 0.05° C., and the readings could be made with certainty to less than 0.01°. The division of the scale, corresponding to 0°, was determined from time to time in the usual way; and another point, about 30° C., was fixed by comparison with four other thermometers similarly constructed, whose scales extended from the freezing to the boiling point of water. The readings of these four instruments, when reduced to degrees, rarely differed from each other within the limits to which they they could be read, or 0.02°. The reservoir of the thermometer used in these experiments was 75 millimetres long, and, when immersed in the liquid, occupied nearly its entire depth.

As some uncertainty always exists with regard to the thermal equivalent of glass vessels, I made two sets of comparative experiments—one with a thickly-varnished copper vessel, and the other with a vessel of platinum. The mean result of these experiments coincided almost exactly with the result obtained when the glass vessel was employed.

The weight of the glass vessel which contained the alkaline solution was 58 grammes, and corresponded thermally to 11.4 grammes of the solutions formed. The thermal equivalent of the reservoir of the thermometer and of the stirrer was 0.9 grammes. The alkaline solution weighed 160 grammes, and contained the equivalent of 1.738 grammes of SO_3. The acid solution weighed 42.5 grammes. Hence the entire thermal value of the apparatus, in terms of the solution formed, was—

Solution	202.5
Glass vessel	11.4
Thermometer and stirrer	0.9
	214.8 grms.

A correction (additive) of 1-240th was made to the direct readings for the mercury in the stem of the thermometer.

In the following table I have collected the results of my experiments, arranging the acids in the order of their thermal action:—

Acid	Potash. Deg.	Soda. Deg.	Ammonia. Deg.
Sulphuric acid	3.378	3.353	2.975
Oxalic acid	3.058	3.040	2.648
Hydrochloric acid	3.021	3.982	2.623
Nitric ocid	2.993	2.929	2.566
Acetic acid	2.852	2.832	2.492
Tartaric acid	2.732	2.710	2.376

It is interesting to observe how closely the results in the vertical columns agree relatively with one another. The acids follow in the same order under each base, and even the differences in the amount of heat disengaged by the several acids in combining with the different bases approximate in many cases closely to one another. Thus the heat given out when the sulphuric acid combines with potash exceeds that given out when the oxalic acid combines with the same base by 0.320°, the corresponding differences in the case of soda and ammonia being 0.313° and 0.328°. If, in like manner, we compare the differences between the heat disengaged by the acetic and tartaric acids, we fall upon the numbers 0.012°, 0.122°, and 0.116. Even in the case of the oxalic, hydrochloric, and nitric acids, which disengage so nearly the same amount of heat, the same order is observed with the three bases. It must be particularly remarked that the oxalic acid disengages from 0.022° to 0.058° more heat in combining with these bases than the hydrochloric acid, and from 0.065° to 0.111° more than the nitric acid.

The conclusion of MM. FAVRE and SILBERMANN, that the organic acids (oxalic, formic, acetic, etc.) disengage sensibly less heat than the mineral acids, is thus entirely disproved; and the original results recorded in my work of 1841, according to which the oxalic acid disengages at least as much heat as the nitric, phosphoric, arsenic, hydrochloric, hydriodic, boracic, and other mineral acids (with the exception of the sulphuric acid) are fully confirmed. The tartaric, citric, and succinic acids, it is true (as was also shown in the same work), give out about 1-14th less heat than the average of the other acids; but the acetic and formic acids fall scarcely 1-30th below the mean, and the oxalic acid is always above it. These results, in all their main features, are fully corroborated by the experiments which were performed with a more perfect apparatus and a more exact thermometer than I had at my command in my earlier investigations. A reference to the same paper will show that, while acids, differing so widely from one another as the oxalic, phosphoric, arsenic, nitric, hydrochloric, and boracic acids, scarcely present any sensible difference in the quantities of heat which they disengage in combining with the bases; and while of the other acids examined the sulphuric acid (and probably also the sulphurous acid) presents an extreme deviation of $\frac{1}{14}$th above the mean, and the tartaric acid group a deviation of about 1-30th below it, the bases, on the contrary (and the subsequent researches of FAVRE and SILBERMANN have confirmed this result), differ altogether in thermal power from one another. Thus, equivalents of the oxides of magnesium and of silver give out 4.1° and 1.8° of heat respectively in combining with nitric acid, the former oxide having therefore 2.3 times the thermal power of the latter. Yet, as is well known, both these bases fully saturate the acid, and the resulting solutions are even neutral to test-paper. For these reasons, I have no doubt whatever that the first law, as enunciated in 1841, is the expression of a true physical law, and that in the combination of acids and bases in presence of water the heat disengaged is determined by the base and not by the acid. It is true that in this, as in similar physical inquiries, experimental results cannot immediately be obtained free from complication or disturbing influences. The same remark applies to the experimental proof of the great law discovered by DULONG and PETIT, which connects the specific heats and atomic weights of the elementary bodies, and also to that of the remarkable relations discovered by KOPP between the composition and boiling points of many organic liquids. We have already seen an illustration of one of these disturbing influences, in the fact that dilute nitric acid, when mixed with water, gives a slight fall of temperature; hydrochloric acid, a rise; and the differences of specific heat in the solutions formed will to a small extent modify the results. But the cause of the higher thermal power of sulphuric acid I have not been able to discover, and future researches must decide whether it depends upon some disturbing cause, or, which is less probable, upon its possessing an exceptionally high thermal power. One condition is, however, essential, or Law 1 will not apply. The acid and base must be capable of combining when brought into contact, and of forming a stable compound. In the paper so often referred to, I showed that hydrocyanic acid and potash, which fail to fulfil this condition, do not disengage the normal amount of heat when mixed; and the same observation will doubtless be found to apply to a large number of metallic oxides, which form unstable compounds with, and imperfectly neutralise the bases.

As regards the experimental proofs of the other laws, even those of the fourth law, the truth of which is admitted by MM. FAVRE and SILBERMANN, they are only approximative; and here also we meet occasionally with peculiar and unexpected results. Thus a slight fall of temperature occurs, as HESS showed long ago, in the conversion of the neutral sulphate of potash into the acid salt; and I found, as indeed might have been expected from their alkaline reaction, that in the conversion of the ordinary phosphates and arseniates into super salts, a disengagement of heat occurs, amounting to about one-seventh of that disengaged in the formation of the salts themselves. In other cases, results, at first view startling and apparently anomalous, will be found to be strictly in accordance with the general principles already laid down. In the formation of double salts there is no disengagement of heat—a principle announced in 1841, and which ought perhaps to be enun-

* Abstract of a paper read before the Royal Society of Edinburgh.
† "Transactions of the Royal Irish Academy," vol. xix., p. 228.
‡ "Philosophical Transactions" for 1844, p. 21.
‖ "Memoirs of the Chemical Society," vol. ii., p. 51.
¶ "Annales der Chimie et de Physique, 3ème ser., xxxvii., p. 497 [1853.]
* Transactions of the Royal Irish Academy, vol. xix., p. 240.

ciated as a distinct law, although it is implicitly involved in Law 2. Again, if tribasic phosphoric acid or arsenic acid is added in fractional portions to a solution of potash till the subsalts are formed, the heat disengaged on each addition of acid corresponds to the amount of acid added; but after this point has been reached, the disengagement of heat follows a different law. The pyrophosphoric acid, on the other hand, behaves in the same way as the nitric and most other acids, when added in successive portions to solutions of potash or soda; equal increments of heat being evolved for equal additions of acid, till the pyrophosphate of potash or soda is formed.*

APPENDIX.

In the following tables I have given the results described in this communication and those of 1841 in a form which admits of comparison with one another, and with those of MM. FAVRE and SILBERMANN. I have also added a few determinations recently made by M. THOMSEN, of Copenhagen.† It will be seen that the original experiments of 1841 exhibit, on the whole, a fair agreement with those now communicated. From the small scale on which they were performed (the whole weight of the solutions after mixture being less than thirty grammes), the imperfect form of the apparatus, and the uncertainty of the thermometric indications, I have indeed been surprised to find them so near the truth. The results of MM. FAVRE and SILBERMANN do not exhibit the precision which might have been expected from the high character of those experimentalists, and from the accuracy of other parts of their great work. The mercurial calorimeter employed by them appears to have been little adapted to its purpose; but after making due allowance for its imperfections, I am at a loss to account for the serious errors into which they have fallen. M. THOMSEN's experiments have evidently been made with care, and his results agree comparatively with my own; but the absolute amount of heat obtained by him falls far short of what I have found. It is indeed much easier to obtain results relatively than absolutely correct. The numbers given in this paper will, I believe, be found rarely to differ *relatively* more than 1-200th from the truth, but they may hereafter require a small correction in respect to their *absolute* value. That correction can, however, be scarcely more than 1-50th of the whole amount; and I have little doubt that the number, for example, given by THOMSEN to express the heat disengaged in the combination of soda with nitric acid will prove to be as far below the true number as that given by MM. FAVRE and SILBERMANN is above it.

TABLE I.—POTASH.

ACID.	ANDREWS, 1841.	FAVRE AND SILBERMANN.	ANDREWS, 1870.
Sulphuric	16,330	16,083	16,701
Nitric	15,076	15,510	14,800
Hydrochloric	14,634	15,656	14,940
Oxalic	14,771	14,156	15,124
Acetic	14,257	13,973	13,805
Tartaric	13,612	13,425	13,508

TABLE II.—SODA.

ACID.	ANDREWS, 1841.	FAVRE AND SILBERMANN.	ANDREWS, 1870.	THOMSEN.
Sulphuric	16,483	15,810	16,580	15,689
Nitric	14,288	15,283	14,480	13,617
Hydrochloric	14,926	15,128	14,744	13,740
Oxalic	14,796	13,752	15,032	....
Acetic	14,046	13,600	14,000	....
Tartaric	13,135	13,651	13,400	....

TABLE III.—AMMONIA.

ACID.	ANDREWS, 1841.	FAVRE AND SILBERMANN.	ANDREWS, 1870.
Sulphuric	14,135	14,600	14,710
Nitric	12,440	13,676	12,683
Hydrochloric	12,440	13,536	12,964
Oxalic	12,684	....	13,088
Acetic	12,195	12,649	12,316
Tartaric	11,400	....	11,744

* Transactions of the Royal Irish Academy, vol. xix., pp. 245-248. The observations of Graham confirm the statement that no heat is evolved in the formation of any double salt. Memoirs of the Chemical Society, vol. i., p. 83.

† Poggendorff's Annalen, CXXXVIII., p. 78.

The Action of the Reciprocating Parts of Steam Engines, and its Influence on the Problem of High Piston Speed.

A Paper read before the Polytechnic Club of the American Institute by CHARLES T. PORTER.

YOUR attention is invited to a proposition which, on its bare statement, will probably strike many persons as absurd. It is, that a reciprocating engine is, with respect to the line of centres, identical with a rotary engine; reciprocation is, in the line of motion, identical with rotation; the reciprocating parts of an engine, at the instant when the direction of their motion is reversed, exert a force which is precisely the same centrifugal force that would be exerted by them continually if they were revolving with the crank, so that reciprocation may properly be defined to be rotation in a straight line.

I am well aware that the doctrine that the reciprocating parts of an engine exert a force on the dead centres, where they are at rest, when their motion in one direction has ceased, and that in the opposite one has not yet begun, is rank heresy; as much so as was once the assertion that the earth revolves on its axis. It is, however, equally true; the demonstration of it is quite simple, and I do not doubt that at every step I shall have your entire and cordial concurrence. If we find ourselves on ground not before trodden, we shall nevertheless be sure that it is firm and solid ground. It should be observed here, that the action which we are to investigate has no *necessary* connection with high piston speed. Although it is what makes rapid speed practicable, and although a correct understanding of it wholly removes any theoretical objection to the employment of such speed, still it takes place at all speeds, varying only in the amount of centrifugal force developed, according to the law of central forces, namely, directly as the mass, directly as the diameter of the circle when the number of revolutions is constant, inversely as this diameter when the velocity is constant, and as the square of the speed in a given circle. The motion of a piston controlled by a crank, we know, is not uniform; but commencing from a state of rest, it becomes at the mid-stroke slightly in excess of that of the crank pin, and at the termination of the stroke has been reduced back to nothing. In giving the piston speed of an engine, we always name its mean speed, found by multiplying the length of the stroke in feet into the number of strokes made per minute, but the speed attained at the middle of each stroke is about fifty-seven per cent. greater than this, having the same relation to it that the semi-circumference bears to the diameter of a circle.

Let us take for illustration the case of a horizontal engine of sixteen inches diameter of cylinder by thirty inches stroke, the reciprocating parts of which weigh 1,200 lbs., and which makes 122.3 revolutions per minute. The mean piston speed is 611.5 feet per minute, while that reached at the middle of each stroke is 960 feet per minute, or sixteen feet per second.

The first question requiring to be answered is: What is the amount of accelerating force, constantly exerted through a distance of fifteen inches, that is required to impart to a body of 1,200 lbs. weight a velocity of sixteen feet per second? We suppose the motion to be without friction, and are inquiring only for the force required to overcome the inertia of the mass. The laws of falling bodies will furnish the answer to our question.

The motion being horizontal, gravity has no effect, either to produce or to destroy it; but a force of 1200 pounds, equal to the weight of these parts, would, by being constantly exerted horizontally through a distance of 16.083 feet, give to them a velocity of 32.166 feet per second, this being the velocity imparted by gravity to a falling body. But what velocity would this force impart by acting through a distance of 1.25 feet? The velocities acquired by a body accelerated by a constant force vary as the square roots of the distances through which the force acts. Thus, a falling body, to acquire a double velocity, must fall through four times the distance; and to acquire a five-fold velocity, it must fall through twenty-five times the distance; and so the force equal to their weight, acting through 1.25 feet, would impart to the reciprocating parts a velocity of 8.968 feet per second—

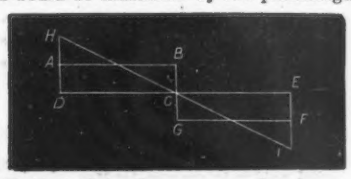
$$\frac{32.166 \times \sqrt{1.25}}{\sqrt{16.083}} = 8.968.$$

But if 1,200 pounds will give a velocity of 8.968 feet per second, what force will be required to impart a velocity of sixteen feet per second? The forces required to impart different velocities by acting through a given distance, must vary as the squares of the velocities imparted. Thus, to give to a body, in moving through a distance of 16.083 feet, a velocity of 64.332 feet per second, or double that which gravity would impart, the accelerating force must be equal to four times its weight; and so the force required to impart to a body of 1,200 pounds weight a velocity of sixteen feet per second, by acting through a distance of 1.25 feet, is 3,820 pounds—

$$\frac{1200 \times 16^2}{8.968^2}$$

We have thus completed the first step in our demonstration. There can be no doubt that our piston, cross-head and connecting-rod have attained a velocity of 16 feet per second, that this velocity has been imparted to them in moving through a distance of 15 inches, and that they must have been accelerated by a force, supposing it to have been exerted constantly, of 3,820 lbs.

But it is obvious that the force accelerating the action of a piston cannot be a constant force, because if it were so, then at the middle of the stroke, where acceleration ends, it must cease abruptly, and retardation must commence in the same manner, as would be illustrated by two parallelograms, A. B.



C. D. and E. F. G. H. in the accompanying figure. know very well that, instead of this, acceleration passes at the mid stroke into retardation in a manner wholly insensible.

How shall this mystery be explained? There are various methods, more or less abstruse, of reaching the explanation, but there is one that is exceedingly simple, indeed so much so, that it is surprising that engineers are not uniformly familiar with it. It is found by almost the mere inspection of the table of versed sines.

The motion of a piston, disregarding the effect of the angular vibration of the connecting rod, is equal to the versed sine of the angle which the crank forms with the line of centres. The versed sine of any angle shows, then, the motion of the piston from the commencement of the stroke. If we take the versed sine of any degree, and subtract from it that of the preceding degree, the remainder will represent the motion of the piston while the crank is moving through the last degree. Thus, in

the above figure, while the crank is traversing the arc A B, the piston is moving through a distance equal to A C, the versed sine of the angle A D B, and so on.

The following table, which any one can complete, shows, in the first column, the versed sine, or total piston motion, for the first and last five degrees which the crank passes through while the piston is making a half stroke, and in the second column, obtained by subtraction as above, shows the motion for each of these degrees.

The motion for each succeeding degree, of course, increases all the way, but in what ratio does it increase? This is the vital question. To answer it, we subtract from the motion for each degree that for the proceeding one, and the difference shows the velocity imparted while the crank was moving through the last degree. In this manner we obtain the third column, showing at a glance the velocity imparted to the piston at each degree, and how wonderful is the revelation! The acceleration, at first nearly uniform, diminishes in an increasing ratio, and for the 90th degree is less than 1-57th that for the first degree, and is just equal to the diminution in the acceleration for the 89th degree, showing how, at the end of this degree, it ceases altogether.

Degrees.	Versed sine, or total Motion.	Motion during each 1o.	Velocity imparted during each 1°.	Difference.
1	.0001523	.0001523	.0003046	
2	.0006092	.0004569	.0003046	0
3	.0013705	.0007613	.0003044	2
4	.0024359	.0010654	.0003041	3
5	.0038052	.0013693	.0003039	2
86	.9302435	.0173992	.0000265	
87	.9470640	.0174205	.0000213	52
88	.9651005	.0174365	.0000160	53
89	.9825476	.0174471	.0000106	54
90	.1000000	.0174524	.0000053	53

The motion during the first two degrees seems to be uniformly accelerated, but if we should go to a sufficiently high place of decimals, we should find the acceleration absolutely greatest on the very dead centre.

It will be interesting to compare this diminishing acceleration with the uniform acceleration of the motion of a falling body. The following table represents the latter, decimals being omitted for convenience, but not at all affecting the table for the purpose of this comparison.

The second and third columns are derived from the first by substraction, in the same manner as above.

Seconds.	Total distance fallen through.	Distance fallen in each second.	Velocity in feet per second imparted during each sec.
1	16 feet.	16 feet.	32 feet.
2	64 "	48 "	32 "
3	144 "	80 "	32 "
4	256 "	112 "	32 "
5	400 "	144 "	32 "
6	576 "	176 "	32 "

If now at each degree we draw an ordinate, perpendicular to the line of centres, and of a length proportionate to the acceleration at that degree, we shall find that a straight line connects all their extremities, showing the acceleration to be represented by the right angled triangle, D C H figure 1.

This any one can verify. It is thus revealed to us, that precisely on the dead centre the acceleration of the piston's motion is double its mean acceleration, and the force required to produce it is twice that which would be constantly required, or in the case we are considering is 7,640 pounds, equal to a pressure of 38 pounds on each square inch of piston area.

This fact is so important, that it may be well to exhibit it also in another manner. We have seen that the motion of the piston is, for the first two degrees, accelerated in a manner which may be regarded as uniform. The distance moved through by a body uniformly accelerated, increases as the square of the time, as is shown in the last table.

If then, we take the co-efficient of the motion for the first degree .0001523, and multiply it by the square of the number of degrees traversed by the crank in one second, we shall have the distance which the reciprocating parts would be moved in one second, at their original rate of acceleration, supposing it to be continued uniform during that time, if the length of the crank equalled 1. This distance is 82.05254 feet, for the crank moves in one second through 734 degrees, and $734^2 \times .0001523 = 82.05254$. The length of the crank is, however, 1.25 feet, so that the distance moved through would be 102.5 feet. This distance, divided by 16.083, gives the quotent 6.37, which is the accelerating force in terms of the weight of the parts. But $1,200 \times 6.37 = 7,644$, the same result as before.

The second point in our demonstration is now established, that on the dead centre, where motion begins to be imparted to the piston, it is imparted in double the average ratio, and the force required for this purpose is just twice as great as a uniform accelerating force would be, to give to it the velocity that it has at the mid stroke.

The retardation of the motion of the piston by the crank, bringing it to rest at the end of the stroke, is the reverse of the acceleration, and is represented by the triangle ECJ figure 1. This to one who has clearly apprehended the acceleration must be sufficiently obvious.

We are arrived now at our final proposition, that the resistance offered by the reciprocating parts to this alternate acceleration and retardation is, at its culminating point—the dead centre, precisely the centrifugal force that the same weight would exert continually, if it was revolving with the crank pin.

Let us examine this action in the light that has now been thrown upon it. We will suppose the steam to be suddenly shut off, so that the acceleration, as well as retardation, is effected through the crank. We note, first, this distinction, that while at the mid stroke acceleration passes, when diminished to nothing, into retardation commencing at nothing, at the centres, on the contrary, retardation passes at its maximum into acceleration at *its* maxium. A closer examination shows, however, that while in the first case the direction of the force changes, in the latter it does not change. This direction must be reversed twice in each revolution, and this reversal takes place at the middle of each stroke, and not on the centre. The crank begins at each mid stroke to retard the motion of the piston, and opposes to it a continually increasing resistance, retarding it more and more rapidly up to the centre line, at which point it begins, *by a continuance of the same force*, to urge it in the opposite direction. The strain of the piston on

the crank, in either direction alternately, begins insensibly at the mid stroke, culminates on the centre, and diminishes to nothing at the mid stroke again, and this resistance, at its culminating point, is the centrifugal force which the mass would exert if it were revolving instead of reciprocating, and at every other point is the horizontal component of that force.

This is readily established. First—The direction of the force is radial. Secondly—The co-efficient of centrifugal force is the decimal .000341, which is the centrifugal force, in decimals of a pound, of one pound making one revolution per minute, in a circle of one foot radius. This co-efficient shows the centrifugal force of 1,200 pounds making 122.3 revolutions per minute, in a circle of 1.25 feet radius, to be 7,650 pounds. This furnishes a simple rule for calculating this force. Multiply together the weight of the reciprocating parts, the length of the crank in feet, and the square of the number of revolutions per minute, and multiply the product by decimal, .000341 Thirdly—This identity is practicably proved by the fact that the reciprocating parts are balanced in the horizontal direction, by an equal weight revolving opposite to the crank, and at the same distance from the centre. Fourth—An examination into the nature of the force itself shows that it *is* centrifugal. What is centrifugal force? It is the resistance which a moving body offers to being deflected from a right line, or, as it is radially at rest, its right line of motion being across the radial line at right angles, it is its resistance to being put in motion towards the centre from a state of rest, and the amount of this motion is the versed sine of the angle—a definition which exactly describes the force under consideration.

But what is the influence of this action on the problem of high piston speed?

We see that it makes any engine in effect a rotary engine if the steam is shut off, the crank passing the centres under the strain of the centrifugal force of the reciprocating parts. But at ordinary speeds this force is developed only in a small degree, varying from 2 to 10 lbs. for each square inch of piston area, and of course the force of the steam is only to this extent expended in overcoming it, the excess becoming at the instant of its admission effective against the crank. Nor at more rapid speed does it become of marked value, unless considerable weight in the reciprocating parts and a short stroke are employed, since it increases directly as the mass, and inversely as the diameter of the circle with a given piston speed. By combining, however, rapid speed and short stroke with considerable weight in these parts, their centrifugal force may be developed to whatever extent we choose, and, if it is in excess of the force of the steam, the engine with the steam turned on, becomes in effect a rotary engine.

The crank passes the centres under a strain not wholly relieved; the force of the steam does not reach the crank at these points, but is absorbed in the mass, and is afterwards gradually imparted to the crank during the stroke. The value of this action it is certainly difficult to estimate too highly. By means of it the shock of the steam on the centres is avoided wholly or in any degree, the excessively intermittent pressure caused by working steam at a high grade of expansion is transformed, as by magic, into a steady and uniform rotative pressure on the crank, the fly-wheel is relieved of its most trying offices, and the shaft from the excessive tersion in alternate directions that is produced by its action, and a smooth and gliding movement is attained, with a closer approximation to uniform motion than the crank has been supposed to be capable of giving.

It is curious to observe how exactly opposite to the truth all the engineering traditions on this subject turn out to be. We have been taught that the reciprocating parts of an engine were passive on the centres, that the great difficulty encountered in the attempt to employ high speed was the necessity of reversing their motion, that they should therefore be made as light as possible, and long strokes should be employed, so that the changes in the direction of their motion might be as few as possible.

Now we know that their centrifugal action on the centres is all important to a high speed engine, and that to render this most serviceable we must employ considerable weight and a short stroke.

The field is a large one; I limit myself to the fundamental principle, which I have endeavored to explain. This being established, all theoretical objection to the employment of high speed vanishes. When the dead centre is stripped of its imaginary terrors, we must perceive the dawn of a new day in the history of the steam engine.

The Cost and Profits of Constructing the Union Pacific Railroad.

(Extract from a Letter to the N. Y. Tribune.)

Now, as to "the gigantic prodigalities" for which the Company is arraigned. Who profited by them, and of what do they consist? Let it be granted that the construction of the road was costly—that some of the contracts, judged by present knowledge, were extravagant—that the whole work, if undertaken to-day, with the benefit of experience, might be finished for much less money. What then? The circumstances under which the work was performed cannot be forgotten. No railroad was ever constructed under difficulties so great and varied. It was literally outside of civilization. It was through a country that furnished no supplies. Materials and labor were transported enormous distances. Everything for the men or for the work had to be hauled to the spot at prices not regulated by the ordinary law of supply and demand. The country was infested with hostile Indians, and arms and munitions and guards were constantly necessary for the protection of the workmen. When work was commenced, gold was at a premium of 100 per cent. and some of the heaviest contracts for iron were made with gold at about 250, making the cost of rails on the Missouri from $150 to $160 per ton. On some portions of the road the cost of the ties was $4 a piece, and hundreds of thousands were laid at that expense. The cost of transportation across Iowa to the Missouri was so extravagant that $75,000 was given to the Cedar Rapids and Mississippi Railroad, merely to hasten its completion. And so the money went in every direction.

The Government, regarding the Pacific road as a national work, urged its construction with the greatest possible rapidity. Rivalry in respect of speed was fostered by the government as between the Union Pacific and the Central Companies. The wisdom of that policy on the part of the government is not now in question. The fact and its consequences are all that now challenge attention. Of the latter, enchanced cost was one of the most obvious. Bonuses were paid to contractors. Prices were made conditional upon the early delivery of materials or the early completion of given work. In one sense, there may have been "prodigality" in all this. But it was a "prodigality" which the government called for and encouraged, and which implies no waste, or corruption, or inefficiency on the part of the Company.

But "incapacities" are alleged against the company. To be just, the allegation should be more specific. Where was incapacity shown? Most certainly not in the construction of the road. The Government allowed twelve years for its completion; it was finished in about one-third of that time. That result was made possible only by tireless energy and consummate skill in every department. The road itself is the best answer to imputations upon the ability of its builders. Indeed, if one were asked what achievement in all history would best illustrate the capacity and the force of the human intellect, one could scarcely point to any more conspicuous example than the building of the Pacific railroad. Its history is the most conclusive testimony, not only to the capacity of its builders, but to their public spirit, their trials and sacrifices, and their title to national consideration.

There were "rascalities," it is said. Doubtless there were. An enterprise like the Union Pacific could not be carried through without affording chances for dishonest or dishonorable men. But the charge should be more explicit, if it can be made so—for the shame of "rascalities" should be borne by the individuals who are inculpated, if they can be discovered. It is not right to inflict upon the Directors as a body the odium attaching to the secret infidelities or swindling of their agents. For the most part, the managers have worked without pay, and even at their own expense, with a devotion and single-heartedness which justly entitle them to a different and better reward than they have as yet received. This remark leads to the main object of the statement now submitted, which is to show how little these gentlemen, and the stockholders for whom they acted, have actually profited by the enterprise.

It has been freely represented, and it is now generally believed, that both directors and stockholders realized untold millions; that the road was built with the proceeds of the Government bonds alone, and that the proceeds of their own bonds have gone into their own pockets—the inference being that men who have profited so largely should not resist the Government claim. It is even said that on this account they are entitled to scant consideration, and that if the law is dubious in its meaning the benefit of the doubt should not be given to those who have been so greatly enriched by other provisions. Let us see how this matter really stands. The profits, whatever they were, were realized in the construction of the road under contracts with the Credit Mobilier, who built the first 247 miles only, and other succeeding contractors who built the remaining portions of the road, and were represented by trustees, it being assumed that the stockholders in the Credit Mobilier, the railroad, and the principals, under the trustees, were substantially the same person. The following figures show the entire financial results of building the Union Pacific Railroad:

The original capital of the Credit Mobilier, paid in to average Jan. 1, 1866, was	$2,500,000	
Interest on same to Jan. 1, 1870, 5 years, at 10 per cent.	1,250,000	
Addition to capital, paid in to average 1st May, 1867	1,250,000	
Interest on same, 3 years 4 months, at 10 per cent.	417,000	
Amount of actual investment		$5,417,000
The other side of the account is as follows:		
First mortgage bonds received from Credit Mobiliers, $1,125,000, at 75 per cent., the present market value	$937,500	
Four years' interest, 6 per cent., gold, average gold premium, 20 per cent.	360,000	
First allotment under Trustees, January, 1863, 80 per cent. on $3,750,000, say $3,000,000, in first mortgage bonds, at 75 per cent.	2,250,000	
Three years' interest, 6 per cent., gold, average gold premium, say 15 per cent.	621,000	
Second dividend under Trustees, June 17, 1868, 60 per cent. cash on $3,750,000, is	2,250,000	
Interest, 2½ years, 10 per cent., currency	562,500	
	$6,981,000	
A dividend of 75 per cent. was declared July 3, 1868, but was not paid except in Income bonds, coupled with the condition that receiver subscribe for two other bonds, at 80 per cent.; the three thus costing $1,600, or about 53 per cent. The market value now being about $400, the dividend entailed a loss of $600 on each bond dividend, say 2,500 bonds	1,000,000	—5,981,000
Net gain on the whole undertaking		$564,000

The result will be shown, proportionately, upon the books of every stockholder who has held his interest to the present time in both investment and proceeds. Ten per cent. interest has been charged as being certainly a low enough rate for money in ordinary business use, and obviously too small a rate for investments of this character. It thus appears that these much-envied gentlemen have barely got their money back, with 10 per cent. simple interest. As a matter of fact, therefore, this undertaking, instead of having proved a financial success, is proved to be a grand failure; as a speculation it was little short of a disaster. The uncounted millions which have been amassed by these proprietors are uncounted, for an excellent reason. Had the Central and Union Companies first agreed upon a point of junction and then proceeded with their work with only ordinary speed, it is safe to say many millions would have been saved to the Union Pacific. But in that case it is clear the loss to the Government and people by the delay would have been many times the amount thus saved to the builders. How confidently, then, may it be urged that this Company has forfeited no claim to generous consideration from Congress!

It will be observed that no account is taken of the stock of the Credit Mobilier. As most of its assets went into the construction of the road, the stock of that company is of uncertain, and perhaps of very small present value. Neither is any account made of the accompanying dividends or allotments of the shares of the Union Pacific Company. The receivers being, as before stated, substantially the original owners of all its stock, they were simply recovering their own in another form. Those dividends were not in any sense divisions of profits. They represented no money made and no increase of property; and in respect of such divisions, therefore, the shareholders cannot be suspected of having enriched themselves or impoverished anybody else.

It does not seem too much to ask that managers who are honestly striving to perform arduous and responsible duties, shall not be embarrassed by an unanticipated construction of the law hostile to their rights, nor by a clamor originating in misapprehension and strengthened by a vague aversion to all great coporations. The idea that they have acquired vast fortunes out of the road has been shown to be erroneous; and the charges preferred against them, affecting the capacity and integrity of their management, are equally untenable. They have nothing to be ashamed of—nothing to conceal. They are surely entitled to demand that their conduct shall be judged only in the light of facts, and that their obligation to the Government shall be measured by the contract as understood by those who framed and sanctioned its terms.

Rough Surveying.

WE unintentionally omitted to append the name of the author to the first of a series of articles on this subject, which appeared in our last issue. These articles are prepared with special reference to the wants of our practical men at the West by Mr. J. THOULET, No. 122 La Salle street, Chicago, Ill.

Plasticity of Rocks.

THE old cobble-stone pavement in Waverley Place, between Broadway and Mercer street, being now in process of removal, my attention has been drawn to the forms of the stones, especially the harder ones, quartzites, etc. The coarser granulated paving stones have generally crumbled, but the compact stones have been modified—convex surfaces in one case fitting into concave in another; none of them retaining a normal form. Now, although the crown of these stones has been worn by the attrition of constant and heavy travel, no such wear can have taken place on their perpendicular surfaces, and I am therefore convinced that they have been moulded into one another by pressure only. On conversing with the workmen, they all concurred as to the fact, and the foreman stated that his attention had been called to it before. Very probably I am myself only repeating what is already well known to others.

MINING SUMMARY.

ANNUAL STATISTICS OF THE PACIFIC COAST.

The following summary of statistics concerning gold and silver mining on the Pacific coast is compiled from the San Francisco *Bulletin*:

TREASURY RECEIPTS.

The receipts of domestic coin and bullion at San Francisco, through WELLS, FARGO & Co.'s Express, for the quarter ending December 31st, amounts to $10,514,066. Through the same agency was also received $531,160 from Mexico, mostly coin. The total receipts of domestic treasure for the year 1876, through the Express Company, amounted to $43,559,955. The monthly amounts and descriptions are annexed:

FROM THE INTERIOR.

	Uncoined.	Coined.	Total.
January	$2,225,151	$683,649	$2,908,800
February	2,095,290	384,223	2,479,522
March	2,441,122	601,842	3,045,964
April	2,559,078	524,814	3,083,892
May	3,015,818	398,289	3,414,107
June	3,246,895	414,184	3,661,079
July	2,851,945	442,891	3,294,836
August	2,878,944	693,656	3,572,600
September	3,004,421	656,675	3,661,096
October	2,338,732	504,037	2,842,769
November	2,857,103	562,312	3,419,415
December	2,397,507	620,465	3,017,972
Totals	$31,915,015	$6,487,037	$38,402,052

COASTWISE.

January	$310,359	$216,500	$526,859
February	215,387	106,960	332,847
March	118,387	134,885	253,272
April	209,278	117,095	326,373
May	254,081	89,881	343,962
June	352,241	119,670	471,911
July	322,480	100,115	422,595
August	523,966	109,638	633,604
September	547,719	75,351	623,070
October	322,237	67,918	390,155
November	366,682	54,195	420,877
December	237,637	185,241	422,878
Totals	$3,780,454	$1,377,449	$5,157,903

Following is a recapitulation of the foregoing totals, to which are added the imports foreign for the same year:

From California and Nevada	$38,402,052
Coastwise, including British Columbia	5,157,903
From Mexico, per WELLS, FARGO & Co	1,894,826
Total per Express Company	$45,454,781
Imports foreign to other consignees	2,095,873
Total	$47,550,654

The amount of treasure received here through similar channel

in 1869 was $51,286,600, against $52,420,800 in 1868 and $53,412,000 in 1867. The difference for this year is partially accounted for by remittances direct to the East from interior points per railroad.

The Express Company report the following shipments from San Francisco to New York, per rail, for 1870:

	Silver Bars.	Gold Bars.	Coin.
January	$113,100	$278,017	$544,378
February	142,700	235,433	898,620
March	137,206	150,793	1,535,300
April	38,400	189,506	533,850
May	22,457	72,724	449,400
June	76,937	389,181	88,300
July	228,058	501,705	$68,012
August	444,445	959,266	83,500
September	784,865	374,983	477,760
October	1,034,584	208,443	300,000
November	1,164 528	43,016	34,936
December	1,179,321	57,482	14,000
Totals	$5,366,601	$3,460,549	$5,528,106

Making a total for the year of $14,355,256, of which $4,036,360 was shipped during the last quarter.

The monthly movement of coin to the interior, through the Express Company, for the past two years, is set forth in the following table:

	1869.	1870.
January	$1,292,619	$1,765,265
February	1,078,420	1,039,702
March	1,472,102	1,176,286
April	1,609,838	1,295,032
May	1,797,435	1,304,959
June	2,393,800	1,796,092
July	1,608,278	1,564,892
August	2,183,150	1,595,326
September	1,802,291	1,829,117
October	2,709.193	1,967,127
November	2,110,335	1,712,250
December	1,762,704	1,587,390
Total	$21,821,165	$28,632,438

Of the remittances for the past year, $10,000 was sent off during the last six months, divided about equally between the two quarters. The coin movement to and from the interior, through the same agency, for two years, has been as follows:

Received from interior	$11,552,595	$6,487,037
Remitted to interior	21,821,865	28,632,438
Added to interior circulation	$10,268,570	$22,145,401

The result shows an increase of 100 per cent. to the interior circulation for 1870. As remittances from the interior come chiefly through private channels, the adverse balances above given are more apparent than real. The figures simply show the operations of the Express Company. In 1868 our receipts from the interior were $6,614,696, and our remittances, $15,823,807.

DESTINATION OF TREASURE REPORTS.

Our exports of treasure, in detail, for the past year, compared with those for the previous year, were as follows:

	1869.	1870.
New York	$12,481,814	$13,522,915
England	11,953,017	9,711,011
France	1,797,126	190,409
China	6,504,722	5,481,876
Japan	2,450,071	1,398,649
Hawaiian Islands	66,000	25,500
Philippine Islands	8,000	.....
Peru	319,862	1,882,087
Chile	.....	487,510
Central America	1,048,211	17,685
Panama	639,191	255,497
British Columbia	20,100	.....
Totals	$37,287,114	$32,983,139

If to the amount this year could be added the shipments direct from the interior, the total would not fall much short of last year. The shipments to New York and Europe have been $2,800,000 less than in 1869, while to Asia there has also been a decrease of over $2,000,000. To Central and South America and Panama there has been a falling-off this year of $550,000.

DESCRIPTITION OF TREASURE EXPORTS.

The annexed table shows the character of our treasure exports for the years 1869 and 1870:

	1869.	1870.
Gold Bars	$13,815,478	$8,345,654
Silver Bars	11,476,705	11,797,196
Gold Coin	7,915,027	9,122,422
Silver Coin	120,000	171,174
Gold Dust	35,237	30,501
Mexican Dollars	3,700,008	3,502 607
Doubloons	6,208	.....
Legal Tenders	218,451	13,284
Totals	$37,287,114	$32,983,138

Our bullion exports for the past year exhibit a decrease of $5,470,000 in gold, and an increase of $321,000 in silver, while our coin exports show an increase of $1,207,000 in gold, $50,000 in silver, and $200,000 in Mexican dollars. As compared with 1868, there has been a falling off in bullion exports of $11,367,000, of which $9,290,000 was due to decreased shipments of gold bullion. Our gold-coin exports show an increase of $6,500,000 as compared with 1868.

ANNUAL EXPORTS OF TREASURE SINCE 1848.

The following table shows the annual exports of treasure from this port since 1848.

1848–50*	$66,000,000	1861	40,676,758
1851	45,989,000	1862	42,561,761
1852	45,779,000	1863	46,071,920
1853	54,965,000	1864	55,707,201†
1854	52,045,633	1865	44,426,172
1855	45,161,781	1866	44,365,668
1856	50,697,434	1867	40,671,797
1857	48,976,692	1868	36,358,096
1858	47,548,026	1869	37,287,114
1859	47,640,462	1870	32,983,139
1860	$42,325,916		
Total			$968,238,520

* Estimated. † Including $5,000,000 duties on imports on Government account.

EXPORTS AND IMPORTS OF METALS, ORES, ETC.

The following are some of the leading items under these heads:

EXPORTS.

Ores.		
New York, tons	1,282	$ 72,668
Great Britain	4,002	459,854
Total	5,284	$532,522
Quicksilver.		
New York, flasks	1,000	$ 30,500
China	4,050	121,500
Japan	40	1,789
Australia	300	9,000
Peru	1,300	55,500
Panama	1	58
Mexico	7,088	255,775
British Columbia	9	430
Total	13,788	$474,552

The ores exported are classified thus:

Ores.		
Copper, tons	2,339	115,217
Gold, tons	1	1,500
Silver, tons	1,628	337,925
Various, tons	1,316	77,880
Total	5,284	$532,522

SAN FRANCISCO MINT OPERATIONS.

The monthly deposits of Gold and Silver at the mint in this city during the year, together with the market range for Gold Bars, have been as follows:

1870.	Gold.	Silver.	Gold Bars.
January, ounces	54,260	8,907	890@900
February	76,874	28,186	890@900
March	80,806	33,090	890@900
April	83,647	27,458	890@900
May	110,447	18,597	890@900
June	80,679	30,476	850@900
July	99,027	33,661	890@900
August	91,804	25,542	890@915
September	93,558	27,251	910@920
October	96,554	52,726	910@920
November	81,629	26,418	900@910
December	79,802	81,025	900@905

The foregoing statement embraces 1,029,087 ounces Gold, of which 682,804 ounces was in fine Bars, sent from the Refinery; and 393,337 ounces Silver, of which 87,500 ounces was in fine Silver, sent from the Refinery during the last five months of the year. In 1869 the Mint received 841,069 ounces Gold and 257,568 ounces Silver. In 1868, the Gold deposits amounted to 888,431 ounces against 992,936 ounces in 1867, and 659,365 ounces in 1866.

COINAGE.

The monthly coinage at the San Francisco Branch Mint during the past year has been as follows:

1870.	Gold.	Silver.	Total.
January	$1,620,000	$40,000	$1.660,000
February	960,000	25,000	985,000
March	2,100,000	55,000	2,155,000
April	1,260,000	70,000	1,330,000
May	2,840,000	40,000	2,083,000
June	2,060,000	46,000	2,106,000
July	120,000	.....	120,000
August	2,370,000	.....	2,370,000
September	2,010,000	20,000	2,030,000
October	1,800,000	75,000	1,875,000
November	1,925,000	40,000	1,965,000
December	1,580,000	96,000	1,676,000
Totals	$19,848,000	$507,000	$20,355,000

DIVIDENDS OF MINING COMPANIES.

Following are the amounts paid to stockholders by various local mining incorporations, during the year ending December 31, 1870.

Black Diamond Coal Company	$300,000
Union Pacific Salt Company	26,250
Amador (California) Mining Company	155,400
Argenta Mining Company	21,000
Chollar-Potosi (Nevada) Mining Company	658,000
Eureka (California) Mining Company	430,000
Golden Chariot (Idaho) Mining Company	75,000
Golden Rule (California) Mining Company	3,000
Gould & Curry (Nevada) Mining Company	48,000
Hale & Norcross (Nevada) Mining Company	504,000
Ida Elmore (Idaho) Mining Company	20,000
Kentuck (Nevada) Mining Company	30,000
Meadow Valley (Nevada) Mining Company	150,000
Metropolitan Mill Mining Company	10,000
North Star (California) Mining Company	16,500
Original Hidden Treasure Mining Company	32,500
Sierra Nevada (Nevada) Mining Company	37,500
Union (California) Minining Company	30,000
Wheeler Mining Company	6,000
Total	$2,552,650

The dividends of San Francisco Mining companies for 1869 are reported at $2,133,400. This apparently does not include coal and salt companies. The increase of the dividends of gold and silver is accordingly $93,000.

MINING STOCK VALUES.

The following table shows the market value of the whole number of shares represented by the leading mining companies on the Comstock Lode on the 31st of December:

Company.	1869.	1870.
Alpha	$108,000	$30,000
Belcher	156,000	83,200
Bullion	25,000	25,000
Chollar-Potosi	532,000	2,100,000
Confidence	54,000	7,800
Crown Point	204,000	192,000
Empire Mill	39,000	7,200
Gould & Curry	331,200	220,800
Hale & Norcross	1,160,000	840,000
Imperial	212,000	80,000
Kentuck	284,000	70,000
Occidental	130,000	5,000
Ophir	252,000	67,200
Overman	240,000	38,400
Savage	720,000	816,000
Sierra Nevada	135,000	270,000
Yellow Jacket	1,248,000	1,152,000
Total	$5,831,400	$6,004,600

The values given to Bullion, Confidence, Empire Mill and Occidental are nominal, as these stocks have for some time been practically out of the market. At the close of 1868 the market value of the tabulated list was $7,744,600 against $6,850,000 at the close of 1867.

These figures of exports are exclusive of shipments to the Atlantic States by railroad.

The following are imports:

Coal:		
Great Britain		$79,142
South America		34,244
British Columbia		84,457
British Australia		182,753
		$380,596
Pig Iron:		
Great Britain		$69,783
South America		909
		$70,692
Railroad iron, Great Britain		$121,316
Iron and steel manufactures, Great Britain		832,739
Tin plate, " "		76,411
Nitrate of soda, South America		53,405

California.

MINING IN NEVADA COUNTY.

The Nevada *Transcript*, of Dec. 30th, says: "The North Bloomfield Gravel Mining Company are still prospecting at the basin at Malakoff. They have gravel, as we before stated, which prospects very rich. The gravel deposit is 208 feet from surface to bed rock, and fifty feet of this prospects big. They have run sixty feet in the main drift, and are running two other drifts in different directions. The gravel is all of the same character, and the bed-rock nearly level, pitching almost imperceptibly to the southeast. The claims are paying well, eleven hands are employed, and the gravel is washed as it is taken out, yielding an average of $350 every twenty-four hours. In order to work this basin to advantage, a tunnel of about a mile in length must be run from Humbug creek. By this means sufficient fall may be obtained and immense deposits of rich gravel will be opened for working to advantage. The Erie mine at Eureka is owned by ALPHEUS BULL & Co., of San Francisco, and about a year or more since the works were destroyed by fire. Subsequent to that time the mine was leased to BEACH & MCCULLOUGH, and last summer they put up a five-stamp mill. A short time since they so far completed the arrangements as to commence running, and they are succeeding beyond their expectations. Forty men are employed. The ledge is sixteen feet wide, and pays from $20 to $30 per ton, including the casings. We understand that BEACH & MCCULLOCH, who hold a lease for three years, have been offered $20,000 in coin for their lease."

THE SUCKER FLAT BLAST.

"The twenty-five tons of powder set off at the blast" (says the Grass Valley *Union*, of Dec. 30th) "occurred at Smartsville, Thursday, at 6 o'clock. Mr. PERRIN, of this place, went down to see the blast, and he informs us that he was well repaid for his trip. The powder was placed seventy feet below the surface of the ground, and was placed so that when the explosion occurred the lift would be vertical. The area of the surface lifted was nearly two acres of ground, and that area arose in the air about forty feet, and then fell back into its place. The powder-gas evolved immediately took fire and burned all over the surface in a beautifully blue flame for a moment, and then went out. The big blast was a great success in a mining point of view, as it has loosened up an immense amount of ground, which will be washed off. For big powder blasts Sucker Flat has beaten the world."

HOW HYDRAULIC MINING IS CARRIED ON.

The Nevada *National* gives the following description of a new and extensive hydraulic mining enterprise in Nevada county: "ROLFE, STRANAHAN & Co. have nearly completed their preparations for hydraulic mining at Cement Hill, about three miles west of Nevada City. They have one of the most substantially-built flumes we have seen in any hydraulic mine in the county. It is 750 feet in length, four feet wide and two feet deep, with a grade of eight inches in every twelve feet. In the flume they have three under-currents, each with a drop of from fifteen to twenty-five feet. These drops are so arranged that all the stone and bulky pieces of cement or other matter will pass over upon slats or bars laid across the end of the flume and be precipitated down the falls, while the gold and finer particles of sand will drop into the under-current and pass over a neatly-jointed flume, about six feet wide and thirty feet long. These under-currents have been found to be excellent gold-savers. The drop, also, is of great benefit where there is cement to contend with, as in making the plunge over upon the rocks the cement is more or less broken up and pulverized. Messrs. ROLFE & Co. have all their pipe upon the ground, and will soon be in complete readiness for work. They have fifteen-inch pipe connecting with their bulk-head, and extending down 500 feet, where it will connect with eleven-inch pipe. They will have 175 feet perpendicular pressure, and will use 500 inches of water. To procure the latter they have in the last three weeks opened over three miles of ditch, which extends from Cement Hill to the Sugar Loaf above the city. The company will commence hydraulicking on a large slide of about two acres, that was caused by a portion of the ground being drifted out many years ago. Only about one-fourth of this slide was drifted out, and it paid well. The depth of this slide will not average more than sixty feet. The company expect, with the amount of water and pressure at their command, to strip off this slide down to the bed-rock in a thirty days' run. They have fitted up their claim in the most substantial manner, and in accordance with the most approved methods for working deep gravel mines. If this company does not succeed in its enterprise, it will not be for the lack of foresight in making good preparations."

Nevada.

WALKER RIVER MINES.

The Gold Hill *News* has the following intelligence in relation to the mines of the Walker river country, from J. F. GLADDING, recently returned from them: "The Indian Reservation, which includes Walker lake and the river itself for several miles above its mouth, has within its limits some thousands of acres of the very best and most fertile bottom-lands in the State, producing blue-joint timothy, clover and other desirable grasses and grazing edibles in the greatest luxuriance. There are at present some 300 of the Biute tribe, men, women and children stopping on the Reservation, but there would be more in case they chose to remain there, instead of roaming at large all over the State, and about the towns and cities of the whites, as they do. They live there comfortably, shifting their campoodies about from time to time, as necessity requires, subsisting on fish, roots, and what pine-nuts and game they can gather in their raids into the surrounding country, and appear to think considerable of the new Indian Agent who exercises a fatherly care over them. The mines in that section are decidedly looking up. There is plenty of copper ore all through that section, and also numerous silver and gold ledges, some of which are being worked into an advanced stage of development and productiveness. In Volcano district, some twenty-seven miles east of Walker lake, is a mine owned by Gladding and four or five other Gold Hillers, which is yielding very well. The ledge is from a foot to several feet in width, being very irregular, situated in a limestone formation, and consisting of rich argentiferous galena ore This yields $175 per ton in silver, and they are shipping it to Swansea for reduction. It is hauled for this purpose to the overland railroad at Wadsworth, 125 miles, by CLEM OGG'S team, over one of the best natural roads in the country, fourteen mules hauling over ten tons at a load. At Columbus, some twenty-five or thirty miles beyond, the mines were also looking and yielding well, lately. Borax is also now included among the valuable productions of Columbus, or rather boracic acid, from which borax is made. This acid is a sort of spongy, mossy, lumpy formation, dug out of the marsh near the town, and being shipped to San Francisco for treatment, it yields a ton of pure borax from three tons of the mineral or acid. Sulphur exists in that section in most bountiful profusion; there are whole mountains of it, or any other quantity desired. There is also any amount of salt. The Virginia salt marsh, of a couple of thousand acres, is only a few miles distant from Volcano district, and is sufficient to supply the whole Pacific coast. This salt is the best for dairy or meat-preserving purposes yet found in the State, and in the vats of the company engaged in manufacturing or securing it there are at present at least 10,000 tons o fthe best quality. Of minerals generally, that section of country has its full share, and GLADDING thinks that none other of its extent in creation can beat it in that respect."

MARKET REVIEW.

The Coal Trade.

NEW YORK, Jan. 27, 1871.

WHOLESALE.—Affairs have not changed their material positions since our last report. The general uncertainty which overhangs everything connected with coal matters makes purchasers very loth to come into the market. What little trade is being done, is from city and near-by-dealers, and does not amount to much. The general tone of the market is not so firm as last week, and those who have coal seem willing to sell at fair rates—say, $7 to $7 50 for Broken Grate and Egg; $8 for Stove alongside. The inclement weather of the past two days has retarded the retail business in the city, and our ice-bound rivers and bays have prevented the transportation of coals from Elizabethport and other shipping points.

There seems to be a "masterly inactivity" in the coal regions regarding the suspension, neither operators nor miners making any advances towards a settlement of difficulties. Probably no movement will be made in this direction for some weeks to come.

RETAIL.—The cold weather of the past few days has caused an extra demand. Pittston Company coals are selling at $5 50 Stove, $6 Steamer, and Egg $5 50 for Chestnut, delivered. Lehigh and other coals, $7 50 to $8 50.

Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Jan. 21,,1871, compared with week ending Jan. 22, 1870.

COMPANIES.	1870. WEEK.	1870. TOTAL.	1871. WEEK.	1871. TOTAL.
*Phila & Reading R.R.	27,319	309 499	4,927	512,031
†Schuylkill Canal	....	....	....	....
Lehigh Valley R. R.	47,923	356,260	1,219	331,336
Lehigh & Sus. R. R.	20,863	53,675	2,020	54,146
†Lehigh Canal	....	....	....	.....
Scranton North	11,913	37,085	....	.....
" South	33,824	88,146	....	.....
Penn. Coal Co., rail	18,594	51,118	810	2,382
" " canal	....	....	....	....
Del. & Hud. Canal Co.	11,168	33,101	9,627	30,084
" " East	2,886	6,598	2,911	9,039
" " West	2,176	5,291	....	....
South	....	....	....	....
Shamokin	4,894	16,076	6,242	22,343
Trevorton	935	1,781	....	....
Lykens Valley Coal Co.	....	....	2,041	4,777
Wyoming South	....	....	....	....
Wyoming North	....	....	....	....
P. N. Y. C. & R. R. Co.	5,333	26,361	838	32,182
Williamstown, Col'y	2,770	9,756	23	17.847
Short Mountain	....	....	2,025	5,034
Total	190,625	994,737	32,686	1,021 201
1870	32,083			994,737
Increase week and year	157,945			26,464

* Less coal transported for Company's use and Bituminous coal.
†Closed for the season.

Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Jan. 21, 1871, compared with week ending Jan. 22, 1870.

COMPANIES.	1870. Week.	1870. Year.	1871. Week.	1871. Year.
B. & O. R. R.	2,668	6,871		
C. & O. Canal			16,362	45,510
H & B. T. R. R.	2,309	8,464	4,071	11,700
Harrisburg & D.	2,497	48,960	7,201	26,681
L. V. R. R.	816	2,559		1,615
P. & N.Y. C. & R. Co.	3,712	25,681	4,314	30,084
	10,002	92,535		

ncrease

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending January 21, 1871—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1871. tons cwt.	WEEK, 1870. tons cwt.	YEAR, 1871 tons cwt.	YEAR, 1870. tons cwt.
Wyoming Region	1500 10	17334 05	37121 04	38218 14
Upper Lehigh Region		938 11	4614 06	1700 01
Mahanoy Region	5 08	120 12	704 05	363 13
Hazleton Region			1043 03	
Beaver Meadow Region				
Tresckow Region	597 04	3433 09	14072 08	15638 11
Mauch Chunk Region				
Totals	2103 02	21826 17	57555 06	55970 19
Increase	19723 15		1584 07	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	2020 06	20863 00	54146 09	53675 17
Forwarded East of Mch Chunk by Canal				
Delivered at and above Mauch Chunk	82 16	650 09	8408 17	1799 07
Delivered to L. & B. R. R.at PlymouthBridge		313 08		495 15
L. V. R. R. at Sugar N.				
Totals	2103 02	21826 17	57555 06	53970 19
Of the above there was transported on acc'nt of L. C. & N. Co.	597 04	4748 18	15308 15	18597 08
W.-B. C. & I. Co.	306 06	7878 13	30248 17	18572 03
Totals	903 10	12627 11	45557 12	37169 14
Increase			8387 18	
Decrease	11724 01			

Pennsylvania Coal Company,

Shipments of Pittston Coal for the week ending January 21, 1871.

	1871. WEEK.	1871. YEAR.	1870. WEEK.	1870. YEAR.
By Railway	810 08	2,382 09	18,594 03	51,108 01
" Canal	— —	— —	— —	— —
Total	810 08	2,382 09	18,594 03	51,108 01
Decrease 48,725 12 tons.				

Delaware and Hudson Canal Company.

The following is a statement of coal transported by the Delaware and Hudson Canal Company, for the week ending January 21, 1870.

	WEEK.	SEASON.
By Del. and Hud. Canal		
By Railroad East	9,627 00	30.084 00
West	2,911 00	9,039 00
South		
Total	12.538 00	40.123 00
Corresponding time in 1870.	— —	— —
By Del. and Hud. Canal	— —	— —
By Railroad East	11,168 00	33.101 00
West	2,886 00	6 598 00
South	2 176 00	5 291 00
Total	16,230 00	44,990 00
Increase		

Philadelphia and Reading R. R.

Amount of coal transported on the Philadelphia and Reading Railroad, Saturday, Jan. 21 1871;

From St. Clair	
" Port Carbon	203 13
" Pottsville	164 04
" Schuylkill Haven	866 06
" Auburn	1,513 07
" Port Clinton	2,122 02
" Allentown and Alburtis	57 16
" Harrisburg and Dauphin	7,201 03
Total paying freight	12,128 11
Coal for Company s use	808 08
Total for week	12.936 19
Previously this year	452,035 05
Total	464,972 04
To same time last year	383,368 15

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, January 24, 1871.

	Total for Week.	Corresponding week last Year.	Increase.
Passing over Main Line and Leb. Val Branch	5,565 13	33,067 04	
For Shipment by Canal	—	—	
Shipped Westward via Northern Central R. R.	2,976 06	2,993 11	
Shipped West or South from Pine Grove	777 06	271 05	506 01
Consumed on Laterals	630 08	1,442 08	—
Lehigh and Wyoming Coal	2,970 05	87 18	2,882 07
Total Anthracite paying fr'gt	12,919 18	37,862 06	
Bituminous	3,876 19	2,225 14	3,651 05
Total of all kinds paying fr'at	15,796 17	40,088 00	
Coal for Company's use	830 08	1.944 15	
Total Tonnage for Week	19 627 05	42,032 15	
Since Dec. 1, 1870	543,500 04	419,251 15	124,238 09
Total to date	563,127 09	461,294 10	101,832 19

SHIPPED BY CANAL.

	Total for Week.	Corresponding week last Year.	Increase.
From Schuylkill Haven	—	—	—
" Port Clinton	—	—	—
Total Tonnage per Week	—	—	—
Since Dec. 1, 1870	—	—	—
Total to date	36,225 17	34,373 16	1,852 00

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending January 14, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	1,576 10	63,990 19
" Hazleton	365 19	205,029 06
" Upper Lehigh		442 06
" Beaver Meadow	137 05	65,607 15
" Mahanoy	860 09	51,204 13
" Mauch Chunk	52 05	963 04
Total Anthracite	2,932 08	387,238 03
Bituminous Coal from all sources		1,615 00
Total by rail and canal	2,932 08	388,853 03
Same time last year	55,263 05	396,092 06
Increase		7,239 03
Decrease	52,270 17	
Forwarded East from M'h Chunk by rail	1,219 04	331,336 19
Same time last year	47,923 08	356,260 15
Increase		
Decrease	46,704 04	24,923 16

RECAPITULATION.

Forwarded East from M'h Chunk by rail	1,219 04	331,336 19
To N. C. R. R., at Mount Carmel		18 00
Forwarded North from L. & B. Junction	838 05	32,172 10
To L. & S. R. R. at Packerton for rail		1,837 02
Delivered at M'h Chunk	5 03	311 16
Delivered on line of road above Mauch Chunk	176 00	2,584 08
Delivered above M. Chunk for use of L. V. R. R.	693 16	9,390 17
To L. & S. R. R., at P'n Har., for railroad		94 10
Do. for canal		7,060 19
At M.Chunk for canal		2,431 02
Total Anthracite	2,932 08	387,238 03
Bituminous Coal		1,615 00
Total all kinds	2,932 08	388,853 03

Lyken's Valley Coal Company.

LYKEN'S VALLEY COLLIERY.

For week ending January 21st	2041 10
Same time last year	....
Increase	2041 10
Decrease	....
Total amount shipped to date	4777 19
Same time last year	....
Increase	4777 19
Decrease	....

BIG LICK COLLIERY.

For week ending January 21st	2025 19
Same time last year	....
Increase	2025 19
Decrease	....
Total amount shipped to date	5034 09
Same time last year	....
Increase	5024 09
Decrease	....

Summit Branch Railroad Company.

The following is the quantity of Coal shipped from Williamstown Colliery, for week ending Saturday, January 21, 1871

	23 08
Same time last year	2,770 02
Decrease, Tons	2.746 14
Total quantity for year	17.847 08
Same time last year	9,756 15
Increase, Tons	8,090 13

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via. the Pennsylvania and New York Canal and Railroad Company, for week ending January 25, 1871:

	WEEK.	LAST YEAR	INCREASE.	TOTAL.
Anthracite	838 05	5.333 12	4.495 07	
Bituminous	4,314 00	3,712 00	602 00	30 084 00
Total	5,152 05	9,045 12		

This decline in anthracite is owing to strikes among the miners in the Wyoming Valley.

Company Coals.

January, 1871.

No quotations during strike.

	L.	Str.	Gra.	Eg.	Sto.	Ches
Scranton at E. Port	—	—	—	—	—	—
Pittston at Weehawken	—	—	—	—	—	—
Lackawana at do	—	—	—	—	—	—
Wilk'b're at Hoboken	—	—	—	—	—	—
Old Co. Lehigh at Pt. Johnston	—	—	—	—	—	—
Lehigh at E. Port	—	—	—	—	—	—

For freights to different points, see "Freights."

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. January 20. R. A.	W. A.	AT PHILADELPHIA. January 21. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$— —	— —	— —
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	— to —
Egg	— to —	— to —	— —	— to —
Stove	— to —	— —	— —	— to —
Chestnut	— to —	— —	— —	— to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	— —	— —	— —	— —
Broken	— —	— —	— —	— —
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A.	6 00	— —	— —
New England	"	— —	— —	— —
Locust Dale	W. A.	5 50	— —	— —
Honey Brook, Leh	W. A.	6 00 to 6 50	— —	— —
Spring Mountain	" "	6 00 to 6 50	— —	— —
Sugar Creek	" "	6 00 to 6 50	— —	— —
Sugar Loaf	" "	6 00 to 6 50	— —	— —
Old Comp'y's	" "	6 00 to 6 50	— —	— —
Cross Creek	" "	6 00 to 6 50	— —	— —
Room Run	" "	— —	— —	— —
Girardville	" "	— —	— —	4 75
McMichael	" "	— —	— —	4 75
Shamokin	" "	5 50	5 25	— —
Lykens Valley	" "	— —	5 75	— —
Broad Top	" "	5 50	— —	— —
Hill & Harris	" "	— —	4 75	— —
Henry Clay	" "	— —	5 00	— —
Powelton	" "	5 50	— —	4 75

*Dealers in these coals may be found in our advertising columns.]

Prices for Coal at Mauch Chunk.

January 1871.

	F. L.	Bro.	Gra.	Eg.	Sto.	Chest.
Lehigh	$3 00	$3 75	$3 75	$3 75	$4 00	$3 00
Wilkesbarre	3 00	3 75	3 75	3 75	4 00	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein...f.o.b. at Phila		$5 00
" " Lemon " "		4 75
Cumberland Vein Coal		4 75
Consolidation Coal Co.'s on board	N. Y.	7 00
Maryland Coal Co.	"	7 00

Prices at Baltimore—January, 1871.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 80@— —
Pittston and Plymouth, do	5 60@5 75
Shamokin Red or White Ash, do	— —@6 00
Lykens Valley Red Ash, do	6 25@— —
Zerba Valley	5 25@— —
Trevorton	6 00@— —
By retail, all kinds per ton of 2240 lbs	7 25@8 25
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 60@4 75
Fairmont and Clarksburg gas, f. o. b. at L. Point	6 00@6 50

Prices at Georget'n, D.C., & Alexandria, Va.

January, 1871.

George's Creek and Cumberland f. o. b. for shipping...$4 40

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@5 50
Lykens Valley	— —@6 25
Shamokin Red or White Ash	— —@5 75
Trevorton and Zerba Valley	— —@6 00

Prices of Gas Coals.

January, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 41-43 Pine st., N.Y.

Duty, $1 25, gold.

	Coarse.	Slack.
Block House	$1 75	@— 75
Gowrie	1 75	@— 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@— 80
Lingan	1 75	@— 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@— 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Currency.
Westmoreland	7 75 @8 00
Fairmount Gas Coal Co. of N. Y.	7 50 @— —
Despard Coal Co	$7 50 @— —
Penn	7 75 @8 00
Newburg Orrel Gas	— — @— —
West Fairmount Gs Coal	8 00 @— —
AT PHILADELPHIA.	
Powelton	$7 80

Prices of Foreign Coals.

January, 1871.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street New York.

Liverpool Gas Caking	$ 9 00@— —
" " Cannel	11 50@12 50
" House "	—@16 00
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel,	18 00@20 00

Per ton 2,000 lbs. delivered.

Foreign and Provincial Freights.

January, 1871.

Closed for the winter.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£14 00@£16 00
Liverpool, 5 per cent primage	13s @16. ton

TO NEW YORK.

Provincial	
Sidney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

TO BOSTON.

Sydney	$ —
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

Rates of Transportation to Tide Water.

Closed for the Season.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon	$2 00
Less drawback of 50 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 84
C. R. R., N. J., Easton to Elizabethport	1 21
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 40

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 84
C. R. R., of N. J., Easton to Pt. Johnson	1 24
Shipping expenses	25
Warfage	10
Total	$2 43

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 84
Morris & Essex R. R. Easton to Hoboken	1 36
Shipping expenses	25
Warfage	10
Total	$2 55

TO SOUTH AMBOY.

L. V. R. & B. & D. R. R.	84
Cam. & Am. R. R.	1 14
Shipping Expenses	25
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	84
C. RR. of N. J. Easton to Elizabethport	1 21
Shipping expenses	25
Wharfage	10
Total	$2 40

Freights.—January, 1871.

TO EASTERN PORTS.	From Philad'a.	From E. Port and Port Johnston.	From Newbury	From Rondout
Amesbury	$2 50	$2 00		
Bangor	2 30	1 60		
Bath	2 30	1 75		
Boston	2 70	1 85		
Bridgeport	1 75	1 00		
Bristol	2 00	1 40		
Cambridgeport	2 75	2 00		
Derby	2 00	1 20		
Dighton	2 30	— —		
East Cambridge	2 35	2 00		
Fall River	2 00	1 40		
Hackensack	1 75	1 00		
Hartford	2 50	1 50		
Jersey City	1 40	60		
Middletown	2 25	1 25		
Mystic	— —	1 25		
New Bedford	2 00	1 40		
Newburyport	2 65	1 85		
New Haven	1 90	1 00		
New London	1 76	1 25		
Newport	2 00	1 40		
New York	1 35	60		
Norwalk	1 80	1 00		
Norwich	2 00	1 30		
Pawtucket	2 30	1 50		
Portland	2 30	1 50		
Portsmouth, N. H	1 45	1 85		
Providence	2 00	1 25		
Rockport	2 10	1 65		
Saco	2 25	1 75		
Sag Harbor	1 70	1 20		
Salem	2 35	1 65		
Stamford	2 00	1 00		
Stonington	2 00	1 30		
Taunton	2 30	1 75		
Warren	— —	1 40		
Washington	1 25			
TO RIVER PORTS.				
Albany				
Catskill				
Cockzackie				
Coeyman's				
Cold Spring				
Fishkill				
Haverstraw				
Hudson				
New York				
Nyack				
Poughkeepsie				
Rhinebeck				
Rondout				
Saugerties				
Sing Sing				
Stuyvesant				
Tarrytown				
West Point				
Yonkers				

METALS.

NEW YORK, January 26, 1871.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¾ to 1¾ cents ℔ lb; Pig, 7 ℔ ton; Polished Sheet, 3cents ℔ lb; Galvanized 2½; Scrap Cast, $6; Wrought, 8 per ton,

	Store Prices.
Pig, Scotch No. 1, ℔ ton	30 00@34 00
Pig, American, No. 1	30 00@— —
Pig, American, No. 2	28 00@29 00
Pig, American, Forge	27 00@28 00
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@100 00

	Store Prices, Cash.
Bar, Swedes, ord'y sizes, less 5 ℔ ct.	— —@110 00
Bar, Refined " "	75 00@ 80 00
Bar, Common " "	70 00@ 72 50
Scroll " "	97 50@125 —
Ovals and half-round " "	97 50@125 —
Band " "	92 50@ 95 00
Horse Shoe " "	95 —@ — —
Rods, ⅜ to 3-16 inch " "	82 50@ — —
Hoop " "	102 50@140 00
Nail rod, less 5 ℔ ct.	6¾—@ — —
Sheet, Russia, as to Nos. (gold)	10½@—11
Sheet, Single, D. and T. Common	4¾@— 6
Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13@14	
Rails, English (gold), ℔ ton	56 00 @58 00
Rails, American, at Works in Pa	70 00 @73 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb. and 10 ℔ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ℔ lb	—	15	@— 18
English Spring (2d and 1st quality)	—	7	@— 10
English Blister (2d and 1st quality)	—	10	@— 17
English Machinery	—	11½	@— 14
English German (2d and 1st quality)	—	13	@— 15
American Blister "Black Diamond"	—	—	@— 12
American, Cast, Tool do.	—	16	@— 17
American, Spring, do.	—	9	@— 11
American Machinery, do.	—	—	@— 12
American German, do.	—	9	@— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 30
Copper Bolts	— @— 32
Copper Braziers, 16oz. and over	— @— 32
Copper Nails	— @— 37
Copper, Old Sheathing, &c., clean	19 @— 20
Copper, Chili Pig	— @— —
Copper, American Ingot	22 @— 22¼
Yellow Metal, New Sheating	— @— 22
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 22

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1¼ cents ℔ lb; Pipe and Sheet, 2¼ cents ℔ lb.

Galena, ℔ 100 lbs.	$— — @— —
Spanish (gold)	6 15 @6 25
German, do.	6 15 @6 25
English, do.	6 20 @6 50
Bar (net)	8 75 @— —
Pipe (net)	10 25 @— —
Sheet	10 25 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25 ad val.

	Gold ℔ lb.
Banca	39½@40
Straits	34½@34¾
English	33¾@34

PLATES.

	Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ℔ box	$8 62½@8 87½		$9 75 @10 00
I. C. Coke	7 37½@7 75		8 37½@ 8 75
Coke Terne	6 23 @6 25		6 00 @ 6 00
Charcoal Terne	7 75 @8 25		8 75 @ 9 50

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ℔ lb

	Gold.
Plates, Foreign ℔ 100 lbs.	$5 87½ 6 12½
Plates, Domestic ℔ lb.	8¾ 11¾

REMARKS.

IRON.—There has been a little more inquiry for Scotch Pig, but at lower prices, the market closing weak and irregular. The sales are 200 tons Glengarnock at $27 75, gold, and 450 do. on private terms. American remains quiet, but steady at $30 for No.1, $28 for No. 2, and $27 @ $28 for Forge; 150 tons No. 1 Thomas sold at $30, and 50 do. Carbon, $30. There has been very little inquiry for either new or old Rails, but former quotations are maintained. Refined Bar is nominally steady at old quotations.

COPPER.—The Manufactures of Copper and Yellow Metal are steady at our quotations. The demand for Ingot is light, and supplied chiefly by holders of outside lots, at prices below those asked by large holders. The transactions in this way embrace 150,000 lbs. Lake Superior and Detroit, at 22c. @ 22½c. for immediate, and 22½c. for forwar

delivery; and 250,000 lbs. Lake, on private terms; 30,000 lbs. Mexican Pig sold at a reserved price.

LEAD.—There has been a little more business in Pig, at prices rather in buyers' favor; sales have been made of 150 tons Foreign at $6 15 @ $6 20; 50 do. Spanish, $6 20, gold; and 50 do. to arrive on private terms. Bar 8½c., and Sheet and Pipe 10½c., with a discount of 10 ₱ cent to the Trade only; Tin-lined Pipe, 5 ₱ cent. Tin may be quoted 17c., less 4c. to the Trade, and 15 per cent. Tin $2, less 4c. to the Trade.

SPELTER.—Remains dull: 20 tons Silesian sold at 5c.; 10 do. Missouri Zinc Co., 6½c., gold, and 53c. do. American Zinc Works, 8¼c., currency.

STEEL.—There is no change in this article, our store quotations being continued.

TIN.—The market for Pig remains very firm, with considerable business at prices steadily favoring sellers; the latest telegrams from London quote English £137, and Straits and Banca £136. Sales have been made of 500 slabs Straits at 33½c.; 200 do., 34c.; 400 do., 34¼c.; 20 days, now held at 34¼c. @ 34½c.; and 15 tons English, 33½c. @ 33¾c., all gold. Plates are in fair demand, and prices are firm, with an upward tendency; the sales are 750 bxs. Charcoal Tin at $8 75 for I. C.; 750 do. I. C. Coke, $7 37½ @ 7 50 for 10×14, and $7 62½ @ 7 75 for 14×20; 500 do., 14×20, $7 70; 150 do. Charcoal Terne, $7 75; 500 do. ordinary brands for future shipment, $8, all gold; and 500 do., on private terms.

ZINC.—Sheet from store is very dull (as usual at this season), at previous quotations—100 casks Mosselmann sold, to arrive, at 8c., less 4 ₱ cent., gold.

ZINC.—Am. Dry, 6¼c. @ 7c.; French, 10½c. @ 11c.; Metallic, 8½c. @ 9c.; Manganese, 4½c. @ 5c.

San Francisco Stock Market.

Our report from the San Francisco Stock Market, "per telegraph," is dated Jan. 24. All of Comstock stocks have reacted. Below is a comparative table for this and the week previous:

Savage	4
Yellow Jacket	40½
Kentuck	32
Chollar Potosi	66½
Gould & Curry	45½
Belcher	10
Imperial	12
Amador	No sales.
Crown Point	—
Hale & Norcross	—

Mining Stocks.

NEW YORK, Jan. 26, 1871.

No sales of Mining stocks. The Mining Stock Board quotes them, and we follow in their track. If our readers receive any profit from following us in turn, we have no cause for complaint, and we shall continue to report "verbatim et literatim" the transactions of the Mining Stock Board, if it only quotes the price of one stock, if we do not get any complaints in the matter. Annexed is the report of the first Board:

	BID.	ASKED
Bates and Baxter	27	—
Benton	6	—
Black Hawk	23	40
Central Gold	9	15
Consolidated Gregory	24	40
Grass Valley	—	—
Gunnell	—	—
Smith and Parmelee	19	20
N. Y. & Eldora	20	—
Quartz Hill	10	15

Petroleum.

Petroleum is stronger and more active, with the exception of Rynd Farm. All of the stocks show a noticeable advance; 200 shares Bennehoff Pet. were sold this A. M. at 10c., and also sales of 500 Buchanan Farm were effected at 41c., and 500 at 45c., which transactions, we hope, are not the last spasmodic contractions of a once great organization, but a renewed vitality, which will once again take root and bring forth good Below is the report of the Board:

	BID.	ASKED
Bergen Coal and Oil	—	—
Bennehoff Run	—	11
Blood Farm	—	—
Breevoort	—	—
Bliven Oil	—	—
Buchanan Farm	39	48
Central	67	70
Clinton	—	—
Home	140	80
hillips Pet	—	—
Rynd Farm	20	—
United Petroleum Farms	12	—
United States	—	80
National	—	—
New York & Allegheney	—	—
Northern Light	—	40
Pitiole Creek	—	—
Rathbone Oil	—	—
Second National	—	—
Sherman & B	—	—
Rynd Farm	—	—

The Slate Trade.

[Corrected weekly.]

("square" represents 100 superficial feet.)

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	$6 50@ 7 00
" green, 1st " "	6 50@ 7 00
" red, 1st " "	15 00@16 00
" variegated, " "	5 75@ 6 20
Pa. b'k and d'k blue, 1st qual., "	6 00@ 7 05

PENNSYLVANIA SLATE TRADE.

SHIPMENTS OF SLATE OVER THE LEHIGH VALLEY, AND LEHIGH AND SUSQUEHANNA R. R., AND THE LEHIGH CANAL:

For the week ending January 21, 1871.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Girard Slate Co.	— squares
Jones & Williams	35 "
D. Williams & Co.	— "
Saylor & Morgan	— "
H. Williams	— "
Lehigh Slate Co.	35 "
American Slate Co.	— "
Hope	— "
Keystone	— "
Locke	70 "
J. Anthony	— "
Kuntz & Woodning	— "
Total	140 "

SCHOOL SLATES.

D. Williams	30 cases.
Lehigh Slate Co.	102 "
Locke Slate Co.	19 "
H. Kuntz	— "
Total	151 "

BLACK BOARDS.

Yerkes & Martin	19 "
Lehigh Slate Co	1 "
Total	20

MANTELS.

Yerkes & Martin	29 "
Lehigh Slate Co	29 "
Total	58 "

MILL STOCK.

Jones & Williams	— "
Philada. S. Mantle Co	— "
Lehigh Slate Co	— "
Yerkes & Martin	— "
	—

TILING, &C.

Lehigh Slate Co.	— "
Yerkes & Martin	— "
E. Hughes	— "
H. F. Martin	— "
	— "

Salt Plains in New Mexico.

Brevet Major General AUGUST V. KAUTZ, U. S. Army, writing from Fort Stanton, New Mexico, informs me that there is a valley of some two hundred miles long and twenty wide, lying between the Sierra Blanca and the San Andreas and Occurra Mountains, in that Territory, in which there is no stream, and only a few alkaline springs and salt lakes, or ponds. Where the road from Fort Stanton to El Paso crosses it, about sixty miles south of that post, is a plain of white sand, apparently granulated gypsum, which has drifted into mounds, forty and fifty feet in height. Water of a strongly alkaline character is obtained by digging a few feet, and around the edges of this district, salt marshes exist, where, in the dry seasons, great quantities of almost pure salt may be collected. The sand is so white, and the plain so extensive as to give the effect of snow scenery. As I do not remember to have seen a description of the place in print, I send you this note with a specimen of the sand forwarded by General KAUTZ.—GEORGE GIBBS.

A New Brazilian Railway Company.

A PROSPECTUS has been issued of the Porto Alegre and New Hamburg (Brazilian) Railway Company (Limited), with a capital of £292,500, in shares of £20, to construct a line of twenty-seven miles in the Province of Srn Pedro do Rio Grande do Sul under a guarantee of 5 per cent. per annum from the Government of that province on the entire capital. This guarantee will yield £14,650, and it is proposed to apply it to the payment of 7 per cent. interest upon £200,000 in preference shares, of which one-half is now offered for subscription, the contractors for the line taking £92,500 of ordinary stock in part payment of £280,000, for which they are to complete the undertaking. The population of the district and city of Porto Alegre is stated to be nearly 100,000.—*Engineering.*

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THE IRON WORLD AND MANUFACTURER has a large and extended circulation throughout the United States, and is taken by Iron and Steel Manufacturers, Machinists, Founders, Hardware Dealers and Tinners, Gunsmiths, Plumbers, Cutlery Manufacturers, File Manufacturers, Saw Manufacturers, Boiler Manufacturers, and by

Leading Railway Officials.

It advocates protection to American Manufacturers. Its markets are full and reliable. If you are a manufacturer, take the journal that advocates your interests. Don't patronize Free Trade journals, but help those who help you

With Free Trade the manufacturers of this country would be ruined. English gold is scattered with a liberal hand to further Free Trade. Expend some of yours to favor Protection.

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1871.

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VOLUME X. COMMENCED JAN 4.

ENGINEERING.

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CIVIL ENGINEERING, as in the erection f buildings the construction of industrial works, public and private, the surveying and laying out of roads, canals, railroads, etc., and the erection of bridges, docks, etc. Being the recognized official organ of the American Institute of Architects, the various papers on subjects connected with building, which are from time to time read before the Institute, will be published in its columns.

MECHANICAL ENGINEERING, as steam engines, hydraulic motors, the construction of tools, machinery, mill-work, etc.

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HYDRAULIC ENGINEERING, as in the planning and construction of water-works, and the improvement of rivers, harbors, etc.

MINING is a subject that receives equal attention with Engineering. The various interests involved in the mining operations of the country, as

THE COAL TRADE,
THE METAL TRADE,
and MARKET REPORTS,

wherever they affect these subjects, are fully cared for, while the principles which relate to mining, geology, mineralogy, chemistry, and metallurgy are carefully elaborated, and all new discoveries relating there promptly detailed. In the practical departments relating to the working and management of mines, whether of gold, silver, copper, lead, iron, coal, slate, marble, stone, oil, salt, etc., will be found, not only the latest news, but a full discussion of the best methods of developing thes important interests and bringing their products int marketable shape.

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Analysis of a New Mineral from Burmah.

By D. WALDIE.

DURING the period extending from November, 1863, to the end of 1864, I had various samples of metallic ores sent to me for analysis by Mr. O'RILEY, the Deputy Commissioner of Martaban, Burmah. They were mostly samples of galena, but one of a different kind particularly attracted my attention as of rather unusual composition, so that I suggested to him that it might be desirable to publish it. To this proposal he assented, suggesting that it should be presented to the journal of the Asiatic Society. Circumstances at the time prevented me from carrying my proposal into effect, but recently I resumed the investigation which had been lying long incomplete.

The analysis of the sample first sent by him on the 24th of July having been unsatisfactory on one point, and the specimen having been exhausted, I wrote to Mr. O'RILEY for another sample, in order to settle this point. In reply he said that he had only a small specimen left, but sent me another small piece from the same range of hills, bearing a strong resemblance to the first, which he thought might probably be the same. I have no information of the locality whence they were got. Mr. RILEY's letters were all dated from Shoaygyeen, except one in February, 1864, from the Karen country. In a subsequent letter he mentioned that the samples referred to were from the same range of hills as a sample of ore he was then sending me, and which turned out to be a double sulphide copper and iron. This is all the information I can give of their source, as some time afterwards Mr. O'RILEY died.

The following is the result of my analysis of the first sample sent on July 24th :

Copper	17·000
Silver	0·096
Iron	36·470
Antimony	1.150
Arsenic	32·760
Sulphur	1·360
Deficiency and loss	10·664
Earthy matter	0·560
Total	100·000

The silver is equal to 81½ ounces, troy, per ton.

The unsatisfactory point which I wished to clear up was the deficiency of 10·624, which I supposed might be oxygen combined with the metals. But this did not appear a very probable solution of the difficulty, and it might rather be owing to errors in analysis. The determinations had all been carefully made according to the usual methods. The arsenic and antimony were separated from the other metals by hydrosulphate of soda, and the arsenic determined as arsenate of magnesia and ammonia, and there was no reason to doubt the correctness of the process. But I had some fear that arsenic might have been lost during the operations preparatory to its separation from the other metals, and an experiment made on the second sample by conducting the analysis in the same way gave support to this view, as by this plan only 31·5 per cent. of arsenic was obtained, instead of the 37 per cent. indicated below by another process. Probably arsenic had been volatilised as chloride.

The second sample sent by Mr. O'RILEY, October 11th, was similar in appearance to the first, but differed somewhat in composition, as will be seen presently. No particular note had been taken of the physical properties of the first sample. The second one was in the form of a flattened piece about $\frac{1}{2}$th of an inch (or 1.2 centimetres) thick, with a dull, blackish, earthy-looking surface. When broken it presented an uneven fracture, of a laminated structure, somewhat cellular, of a steel grey color with a purplish tint and metallic lustre. In general appearance it is like mispickel, but of a redder shade. Minute specks of brownish green matter could be seen here and there on the surface, particularly between the lamellæ, when these presented themselves to view edgewise. It gives no streak on paper, but a dark grey one on unglazed porcelain. Hardness, 5.5.

Specific gravity at 81° F. (27° C).

In small pieces	7.343
In powder	7.428

The pieces were boiled in the bottle, but no doubt still retained air in some interior cells.

It is easily soluble in nitric and nitro-hydrochloric acids, with evolution of nitrous fumes. One portion was dissolved slowly by diluted nitric acid containing 3 per cent. its volume of nitric acid of 1,400, and the solution completed somewhat more rapidly by a solution containing 5 per cent. its volume. Hydrochloric acid at atmospheric temperature dissolved it partially by standing some time (two or three days), to the extent of about 10 or 11 per cent., and by repeated boiling about 13 per cent. more, but there appeared no definite limit to the action. Acetic acid dissolves a portion, evidently oxidised matter.

Ignited in a platinum crucible it caked together, lost its metallic lustre, and became of a brownish color, but whitish at the edges where it adhered to the crucible and was removed with some difficulty, having slightly attacked the platinum. By this ignition it increased nearly 2 per cent. in weight. Ignited in a small glass tube by the blow-pipe till the glass softened, it did not appear to yield any arsenic.

In the analysis of this sample, the arsenic (with a little antimony) was separated from the other metals by fusing with nitrate of potash, and carbonate of soda (potassium nitrate and sodium carbonate), or by passing chlorine into the mineral first oxidised by a little nitric acid, then mixed with solution of potash in excess and chlorine passed through it. This plan answered very well. The results of two analyses for the three principal constituents, agreeing very well, were as follows :—

Copper	13.28
Iron	43.88
Arsenic	37.03

A complete analysis was made by digesting a portion for about twelve hours with diluted hydrochloric acid, and thus removing the oxidised matters. The results were as follows :—

Soluble in dilute hydrochloric acid.		
Oxide of copper	1.21	
Protoxide of iron	1.97	
Oxide of lead	1.89	
Arsenious acid	1.12	
		6.19
Insoluble.		
Copper	12.13	
Iron	42.12	
Arsenic	38.45	
Antimony	0.54	
Earthy matters	0.12	
		93.36
		99.55
Loss		0.45
		100.00

In one small piece I found 2.67 per cent. of matters insoluble in nitro-muriatic acid, but generally it was very small.

It will be observed that this sample differs from the first in the smaller proportion of what may be considered accidental constituents, and is a purer specimen of the essential constituents, arsenic, iron, and copper. The inside pieces contained no sulphur ; the outside crust yielded a trace probably in the state of earthy sulphate. And while the first sample contained a notable quantity of silver, this did not appear to contain any, or at least so little that I could not detect it in the amount of material at my disposal. The quantity of antimony was also less than half that of the first sample.

I have not been able to find in any book on mineralogy I have had access to a description of such a mineral. The nearest are arsenical iron pyrites (mispickel) and axotomous arsenical iron. But it differs from the former in the total absence of sulphur, and from both in the presence of a considerable quantity of copper, as well as in the larger proportion of iron, and it differs still more in the proportion of the two basic metals together to the arsenic, the latter being small in proportion to the former.

The constituents approximate, though not very closely, to two equivalents of arsenic, six of iron and one of copper ; rather more than six of iron and less than one of copper. This can scarcely be reduced to any probable atomic formula ; but if the proper metallic nature of arsenic be admitted it may be considered as an alloy, and alloys are not limited in their composition to definite formula. The excess of basic metals in its composition gives it a fixity under the action of heat not very usual in arsenides or unoxidised arsenical compounds.

I would venture to propose for this mineral the name of O'Rileyite, in honor of the gentleman who sent it to me, whose services have unfortunately been lost to the Indian Government by an untimely death. This notice may perhaps lead explorers of these districts to discover additional specimens of this or analogous minerals.—*Chemical News*.

CORRESPONDENCE.

SALT LAKE CITY, UTAH, Jan. 10th, 1871.

TO THE EDITOR—Sir : The criticisms on Senator STEWART's new Mining Bill, and the valuable suggestions in your editorial on the provisions of the same, contained in your paper of 20th ultimo, should claim the attention of not only our members of Congress, but all interested in mining for the precious metals, to the end that free discussion of the important subject of amendments to our present mining laws may induce an intelligent understanding of the whole matter by our National Legislature, in order that before the present session closes, they may enact as perfect laws as a thorough examination of the whole subject will permit, and which would be satisfactory to the Government, the capitalist and the miner, protecting each in their respective rights. That the present law is crude, and its provisions not adequate to protect either the discoverer of mines, or the capitalist who furnishes money to work them, all must admit ; and although the new bill would be a great addition to the laws now extant, still it does not go far enough to cover all the points we should have in a new bill. You notice a provision in the first section of the new bill that makes locators and their assigns *owners*, leaving an inference that it abolishes the system of mining patents. Doubtless Senator STEWART only intended to protect discoverers and locators of lodes who should be owners as against *practical re-locators*, who now infest mining districts in large numbers, and never perform any work, but hope by clouding a title to make something out of it ; in short, they stand ready, with the assistance of dishonest recorders, to steal from the true owner his just rights, or to plunder a stage-coach or railroad train, as best suits their convenience. Your remarks in regard to the present absurd system of local regulations in mining districts are eminently just, and the time has come for the United States to adopt a general system of regulations for locations ; size of claims ; metes and bounds ; amount of work to be performed to hold possession of claims, or to obtain a patent, etc. All local laws should be abolished at once, and mining records deposited with county recorders who, under suitable regulations, should be authorized to record locations, etc. In districts distant from his office, he might have power to appoint deputies (and for whom he should be held responsible), to receive for record, locations, deeds, etc., to be forwarded to the county office, there to be entered on the books. That some such regulations as the above have become absolutely necessary must be apparent to all interested in mining, as the non-responsibility of mining recorders has caused a vast amount of litigation and bloodshed, with still more to come in the future, if the present system is not abolished. The days of "Ye honest miner" have passed away, such as gathered the glittering dust in California years ago, and the full "buckskins" could lie about anywhere unmolested ; and in their stead strolling vagabonds interfere with the rights of discoverers, and if necessary, change the laws to facilitate their stealing on the wholesale principle, or manage to get on packed juries to rob capitalists who have enterprise enough to invest in mining. All these matters that retard the development of our mineral resources should be remedied by Congress without further delay.

With few changes, I think the laws proposed by Judge DUNNE, in the Report of Commissioner RAYMOND for 1869, the best as a whole that could be adopted ; though, having some experience in mining, I suggest the following amendments. 1st., as to size of lode claims—1,000 feet in length for the discoverer, and 1,000 feet more for as many names as the discoverer chooses to put in, but not exceeding 500 feet to one person. As it is but seldom the outcrop of a vein or lode can be traced more than 2,000 feet, I consider that length enough for any company to work, and in width 250 feet on each side of the vein ; the claim to be defined by a mound and post at each of the four corners within thirty days after discovery. 3d. The amount of work to hold possession of a claim or lode to be twenty days in each year. 3d. That when an amount of work to the value of $300 shall have been performed, a patent shall issue agreeably to the present law. 4th. All veins of ore in a tract of land patented shall be included in the claim. An objectionable feature in the second section of Senator STEWART's new bill, is that which declares that not less than 40 acres nor more than 160 shall be taken in connection with each claim of 200 feet on a lode for use as mill or furnace site, water, fuel, etc. As a general rule, there are but few localities where so much land could be allowed to one company even, without depriving many others of the necessary facilities required to carry on their business. Eligible mill or furnace sites with wood and water are limited in mining districts ; therefore, I hope the Hon. Senator will amend the second section, by allowing not more than ten acres for a mill site, or for a furnace, if on a stream or lode of water, and one hundred acres of wood and other land ; or perhaps it would be best to leave the amount to the registers of the different land districts, they being better able to decide in their several localities what could be allowed to one company without detriment to others.

Such, Mr. Editor, are some of the views I entertain on this important subject, trusting a thorough discussion will result in the adoption of just laws for our guidance in developing mines.

Permit me to say a few words about Utah and her mineral wealth, and I will close. This Territory will soon occupy a position in the front rank of mineral-producing districts ; the developements have been slow, and for good reasons. The first discovery of argentiferous galena ore was made by the accomplished ladies of Dr. R. K. REED and Judge O. B. WAITE (the latter authoress of "The Mormon Prophet and his Harem"), whilst out on a pic-nic party in Bingham Cañon, twenty-five miles from Salt Lake City, in 1864, soon after the California Volunteers came here to take care of Uncle Sam's domain during the late war. Gold was found at the same place soon after, and about $100,000 have been washed from its placers since that time. The Volunteers from that first discovery commenced active prospecting, and during the years 1864, 5 and 6, made hundreds of locations of lodes in the Big and Little Cottonwood and Bingham Cañons, Rock Valley and East Cañon Districts, and doing a great amount of work, proving the value of the mineral lodes as soon as cheap and quick transportation should be furnished to take the ores and bullion to a market east or west. The time came last year, when the great Pacific and Utah Central Railroads were finished ; and now both *saints* and sinners stand ready to rob the discoverers of their property, even where shafts and tunnels were run into the mines from twenty to sixty feet. The officers and soldiers invested much money in opening mines and building furnaces of such materials as could be found in the country, though machinery was even transported here at great expense. Freight from the Missouri river being twenty-five cents per pound, it was soon found that this class of ores, though rich in silver, could not be worked profitably at that time, so they have patiently struggled along until the present time, having faith that their rights would be respected by the Government and courts, if not by individuals, and that now as pioneers of mineral discovery in Utah, when the discoveries are of value they hope to receive the reward they are entitled to, and not be compelled by force of numbers to give up their claims, where the local laws have been complied with, and the same confirmed by Congress, when application is made for a patent. The Mormon leaders have suddenly discovered it is a good thing to own mines, though until very recently, the saint who advocated mineral developement was cut off at once from the church. In regard to what Utah will produce from her mines, I venture to predict for one item—that in one year it will not be necessary to import a pound of the 40,000 tons of lead that is now imported annually from Europe. The amount of silver produced will be wonderful. One mine at Little Cottonwood produces now about 100 tons of ore per diem, which yields about $200 per ton in lead and silver, or about three times as much as all the mines in "White Pine" produce. Still, no "White Pine" excitement stirs the home of the Saints. D. R. S.

TO THE EDITOR—Sir : I find in your number of JANUARY 3, a communication from Mr. SEEY, of the New Zealand Geological Survey, concerning the fusibility of platinum before the common mouth blowpipe, which is supposed by him to be a new observation. In regard to this I would observe, that the fusion of a platinum wire, one-tenth of a millimetre in diameter, in the oxidation flame, was required of his pupils by PLATTNER, twenty years ago, as a proof of being able to make that flame effectual ; and the experiment is recommended by him to beginners, for that purpose, on page 14 of the last German edition of his work on the blowpipe. A fine shred of the foil usually used in Grove batteries can readily be fused by any one able to blow a clean oxidation cone, as required in most quantitative fusions before the blowpipe. EUG. W. HILGARD.

UNIV. OF MISS., Jan. 13, 1871.

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor.

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The Alta California.

SOME weeks ago, we published an article concerning the bullion product of 1869, in reply to two journals, which had assailed Mr. RAYMOND'S estimates on two totally different grounds. The Chicago *Tribune* declared his aggregate to be much too high, basing its opinion on certain estimates of Mr. LOUIS GARNETT, and on certain arguments of its own concerning the specie reserves of the country. The *Alta California*, on the other hand, complained of the Commissioner for "allowing California but $20,000,000, or less than one-third of the whole," and continued:

"Why such statements are put forth as quasi-official, we do not know, since there are official data which approximate the real production. These data are furnished with nearly perfect accuracy by the Mint and Custom House. All the bullion produced finds its way either to the one or the other. It is either exported as bars, or coined at the Mint; crude gold is not hoarded for the reason that producers cannot afford it. In illustration of the production of this coast, we give the official figures of bars taken at the Mint of San Francisco, and those exported for two years to July 1, 1870:

	Gold bars—Sent to Mint.	Silver. Exported.	Total.
1869	$18,592,340	$14,313,558	13,331,010 $46,236,908
1870	19,821,907	10,385,828	10,773,203 40,980,933

"The decline in the supply has been due almost entirely to the Nevada and northern mines, British Columbia, Idaho and Montano, which was formerly received here. British Columbia alone has declined several millions, and the gold extracted from Nevada silver has been less; nevertheless the gold receipts in this city in twelve months to July, 1870, have been $30,207,730; besides $10,773,203 of silver, making nearly two-thirds of all the production estimated by the Commissioner. The decline in the Nevada product is probably temporary as far as Washoe is concerned, but California product is on the increase. The product was disturbed last year by the White Pine excitement, but has been resumed advantageously; one important mine has been suspended some months by the accident of fire, but will be resumed shortly. The same data which we have here applied to the bullion receipts of San Francisco, if applied to the whole Union, show that the aggregate production of gold is $50,487,513, as follows:

Deposited at Mint (official)	$21,824,767
Exported as bars	28,662,872
Total gold product	$50,487,513
Of which at San Francisco	30,207,730

"Thus, instead of California having less than one-third, it has three-fifths of the gold."

To which we replied that the *Alta's* figures referred to the fiscal and not the calendar year; and, secondly, that the production of the Pacific coast, and the production of California, were two different things, which the *Alta's* argument against Mr. RAYMOND'S estimates evidently confounded. Mr. RAYMOND never put the product of the *Pacific coast* at $20,000,000, as the *Alta* should know very well. We admitted, moreover, an under-estimate of $2,000,000 for California, and explained the circumstances under which it arose. The *Alta's* article, quoted above from its issue of Nov. 5, displays in this respect either carelessness or intentional misrepresentation. *It distinctly attacks* Mr. RAYMOND *for giving California "less than one-third,"* then adduces the figures showing the alleged production of the coast (*i. e.*, the receipts at San Francisco), and adds similar figures for the gold product of the whole country, claiming to show that, "*instead of California having less than one-third, it has three-fifths of the gold.*"

This ingenious antithesis, by the way, is itself calculated to deceive the reader. The Commissioner's first estimate gave California nearly one-third of the whole product; and, as corrected by us, it gives her a million more than one-third of the whole, including silver. The *Alta's* argument will read, if untwisted and smoothed out, "Mr. RAYMOND gives California only one-third of A + B; but California, and some other States and Territories, produce three-fifths of A; hence Mr. RAYMOND'S estimate for California is much too small." The fact is, that Mr. RAYMOND'S estimate for California gives her nearly three-sevenths of the gold, and his estimate for that portion of the Pacific States and Territories shipping bullion to San Francisco gives them about three-fifths of the gold; so the *Alta* has nothing in reality to complain of.

In the same article, we had occasion to discuss Mr. GARNETT'S estimates, on which the Chicago *Tribune* relied. What we said of them has nothing whatever to do with the point made by the *Alta*, which did not accuse the Commissioner of overestimating totals, but of underestimating a particular State. This would have been clear to every reader of our article; but the *Alta* did not choose to permit its blunder to be exposed; and in its issue of January 11, it attempts to cover up its tracks by publishing a long communication from Mr. GARNETT, on the question of the alleged overestimate, and claiming that this "so thoroughly demolishes the Commissioner that but little remains to be said." Whether the Commissioner is so easily demolished will appear when we come to deal with Mr. GARNETT and his diatribe, a duty we shall promptly discharge, when we have got through with the *Alta*, which sneaks behind him.

Respectable journals, in conducting such controversies, either quote, or fairly represent, what an antagonist advances. In this case, we first gave the substance of the *Alta's* argument, and our reply. We have quoted that argument above, that our readers may judge whether we gave it fairly. The *Alta's* rejoinder is that its figures were given, not as the product of California, but as the product of the coast received at San Francisco. Well, who said anything to the contrary? The *Alta's figures* were not called in question, but its unjust and illogical application of them.

If that journal really means to meet the issue fairly, let it reply to these questions:

1. Does it now assert that California alone produced more than $22,000,000 in the calendar year 1869? If so, how much more? If not, then what did its attack of November 5th mean?

2. Does it now assert the *gold* product of the whole country for the *fiscal* year 1870 to have been over $50,000,000? If not, what did its assertion of November 5th mean?

3. Does it now assert that the Commissioner's estimate for the whole Pacific Coast was too small? If so, what does it call the Pacific Coast, and what does it imagine to have been the Commissioner's estimate?

4. Had it read the Commissioner's remarks on this subject when it attacked his report in November? And if so, where did it read them? Had it any notion whatever of the manner in which the estimates were prepared, or the value attached to them by the Commissioner, or the space they occupy in an octavo volume of 800 pages, the whole of which it undertakes to condemn as worthless, wondering "why it is published at the public expense?"

Mr. GARNETT will please keep out of this particular fight, especially as his views condemn the *Alta* as decidedly as they do us. He makes a direct and forcible attack, which shall be fairly met. The *Alta* skulks, and is unworthy company for him.

One other sample from its recent editorial will suffice to show what are its peculiar notions of honesty in debate. It says in conclusion,

"How little the Commissioner understands the point appears from his hap-hazard remark that the 100,000 travellers who left the country in 1869 may have taken specie. We presume he does not think they carried bars of gold. If they carried coin, it was all accounted for at the Mint first, and is embraced in the table of production. Upon the whole, we have seldom seen so melancholy a muddle as the defence of the report—if we except the report itself; and we cannot understand why such misleading documents are published at the public expense."

The remark here quoted from our article was a reply to the argument of the Chicago *Tribune*, relative to the specie reserve in the country. It is lugged by the *Alta* into a connection where it does not belong, and this use of it is in a double sense impertinent.

The *Alta* has "never seen so melancholy a muddle" as our defence, "except the report itself." After its exhibition of candor and intelligence, we take leave to doubt whether it ever has seen the report itself. Of course, it will now feel bound to abuse (without quoting) that document, although it has repeatedly taken occasion to praise Mr. RAYMOND'S first report, which presented similar features to those it so furiously attacks in his present one. We can only appeal from the *Alta*, now drunk, to the *Alta*, formerly sober; and to the public at large, which still retains, we trust, a *penchant* for truth and fair play.

So much for the *Alta*, of which our remarks hold good, whether Mr. GARNETT has or has not "demolished the Commissioner." Demolishing a commissioner does not obliterate the files of a newspaper, nor their record of stupidity or malice. But Mr. GARNETT and his demolishing onslaught will be the subject of separate consideration hereafter.

The Union Pacific Railroad.

THE controversy between the Government and the Union Pacific Railroad Company, as to the payment by the latter of the current interest on its second mortgage bonds, is a matter of law, and ought not to be prejudiced by considerations of another character. The attempt to create a public sentiment against the management of the company, on the ground that they realised immense profits out of the construction of the road is not pertinent, if it were well-founded. But it has always been our opinion (frequently expressed) that it is not well-founded. We publish in another column a portion of a letter to the *N. Y. Tribune*, which we believe sets forth substantially the truth of the case, and from which it appears that the alleged vast profits of this enterprise were in fact very moderate indeed, at least to the parties furnishing the capital.

New Publications.

HANDBOOK OF MINERAL ANALYSIS, by FRIEDRICH WÖHLER, Professor of Chemistry in the University of Göttingen. Edited by HENRY B. NASON, Professor of Chemistry in the Rensselaer Polytechnic Institute, Troy, New York. Philadelphia: HENRY CAREY BAIRD, Industrial Publisher, 406 Walnut street, 1871. Price, $3.

The original work of which this is a translation has for years been regarded in Germany as the best authority, as well as the most complete treatise of its size, on the subject of mineral analysis, and this translation of the latest German edition is, we think, calculated to supply to the American student or mineralogist easy and rapid methods of determining the constituents of all the important minerals.

The "Mineral Analysis" is not intended to replace the large standard text books on chemistry, but rather to serve as a useful auxiliary to them, or to be used as a guide by the practical mineralogist who is already acquainted with the manipulations and general methods of analysis.

The translation is a good one, and this fact, coupled with the well known reputation of the original work, is sufficient guarantee for the scientific accuracy and excellence of the methods proposed.

Prof. NASON might have chosen to display himself as the author of an "original" work. Certainly his reputation and ability would have justified him; but he has shown excellent good sense and true devotion to science in devoting his time to so modest, yet so important a task as the translation of a standard German work. Such a labor requires for its proper performance a high order of talent; and should not be (as it sometimes is) scorned by the ambitious *savant*. Especially when a book is to become a recognized manual, like this one, the work of its translator and editor is by no means contemptible. Chemical science is progressive, new methods of analysis are continually proposed; and while the work before us is well up to the present stage of the science, it will be necessary for the author from time to time to prepare new editions, in which he must display great judgment and careful study in selecting only the very best and most accurate of the numerous improvements or alterations which come under his notice. In this way we hope to see the work continued, and to have WÖHLER'S "Mineral Analysis" become as familiar to the American as it is to the German student.

The practical character of the book cannot fail to commend it to those engaged in the arts based on chemical operations.

Polytechnic Club of the American Institute.

Meeting held at the rooms of the Association, Jan. 19, 1871. Prof. S. D. TILLMAN in the chair.

THE President presented the following items of scientific news:

TIERS ARGENT.—This alloy, generally supposed to consist of one-third silver and two-thirds nickel, has been analyzed recently by Dr. C. WINKLE, and found to be composed of silver, 27.56 parts; zinc, 9.57; nickel, 3.42; copper, 59.06; total, 99.61.

THE WATER-HAMMER MADE LUMINOUS.—Prof. LOMMEL has made a series of experiments which prove that the water-hammer, consisting of a glass tube and bulb partly filled with water which had been freed from air by long-continued boiling, when electrified in the same manner as the Giessler tubes containing a rarified gas, is affected like such tubes, and exhibits brilliant luminous phenomena.

Dr. BRADLEY remarked that this served to show that vapor of water, in an attenuated condition, conducted electricity in the same manner as the gases.

PROPOSED SHIP CANAL IN ENGLAND.—A plan for shortening the sea passage between the Bristol and English channels, by the construction of a ship canal across the counties of Somerset and Devon, has been approved by prominent engineers, and is about to be brought before the public authorities for their sanction. The length of this canal is to be fifty-nine miles, its width at the surface 124 feet, at the bottom thirty-one feet, with a depth of twenty-one feet. This would allow all vessels of moderate draught to pass through from sea to sea. Such a canal would doubtless be of immense advantage to the coal traffic of Wales.

FUSION OF IRIDOSMINE.—Mr. M. G. FARMER, of Boston, has succeeded in fusing iridosmine by a current of voltaic electricity from sixty large Bunsen cells. Grains of the mineral were placed in a groove made in charcoal, each end of which was connected with a large platinum wire. The temperature of fusion was estimated at about 10,000° Fahrenheit. His object was to obtain a pure alloy of iridium and osmium, to be used in electric illumination. On bringing one square inch of the alloy to near the fusing point, by means of an electric current, he found the light emanating from its surface equal to 2,800 candles. This new light threw shadows at midday, and had sufficient actinic power to produce excellent photographs.

Dr. FEUCHTWANGER said of this substance, that it was exceedingly difficult to melt. He had made some attempts in this direction with the compound blow-pipe, but had not succeeded in obtaining a perfect fusion.

[If this substance could be fused into homogeneous masses as hard as the natural alloy, it would be of great value to the gold-pen makers, as it would enable them to utilize "points" which, from small size, irregularity, and flaky structure, are now useless. Selected "points," for pens, are worth about $200 per ounce.]—REPORTER.

RAIN.—Mr. JAMES GLASSIER, F. R. S., of England, in a recent lecture, said that the whole of the rain had its origin and fall 800 feet from the earth. Desiring to discover the influence of the moon on the elements, he found, after a long series of investigations, that on the ninth day of the moon there was much more rain than on any other day, and that on the first and last week of the moon there was the least amount. He had taken account, from 1815 to 1863, of every day on which

there had been an inch of rainfall, and he had found that on July 26, 1867, the rainfall amounted to three and seven-tenth inches—the largest amount that had fallen in one day at the Royal Observatory. From careful observations made by him he had no doubt that the moon did exercise an influence upon rain. Another of his investigations was as to the time of day that rain fell most, and he had found that the largest quantity of rain fell at about four in the afternoon.

DR. BRADLEY said he thought that the greatest amount of rain in our country fell in the afternoon, and thought that it would coincide with the time of the greatest number of thunder showers. He held the opinion that rain formed at all heights, and adduced the formation of hail as a proof. There was some little discussion of the point, but there were no facts brought forward to prove any of the statements made.

QUANTITY OF CARBONIC ACID GAS CONTAINED IN THE AIR OF SCHOOL-ROOMS.—From the *Amerikanische Schulzeitung* we learn that Dr. BREITING, of Basle (Switzerland), has examined the air in the school-rooms of that city. As one of the results of his examination we give the analysis below of air taken in a room measuring 251.61 cubic meters, having 10.54 square meters of windows and doors, and containing on the day of examination fifty-four children :

Time.	Quantity of Carbonic Acid Gas.
7:45 A. M., before the commencemont of school,	2.21 parts per 1,000
8 A. M., end of first recitation	4.30 " "
9 A. M., after the recess	4.07 " "
10 A. M., before a brief recess	6.87 " "
10:10 A. M., after the recess	6.23 " "
11 A. M., end of the recitation hour	8.41 " "
11:10 A. M., the room being empty	7.30 " "
1:45 P. M., before the commencement of school,	5.08 " "
2 P. M., beginning of recess	7.66 " "
3 P. M., after the recess	6.46 " "
4 P. M., end of singing lesson	9.36 " "
4:10 P. M., the room being empty	5.72 " "

A NEW DISINFECTANT.—The hydrated chloride of aluminum, long known to chemists, has lately been extensively used as a disinfecting agent. It is readily made by dissolving alumina in hydrochloric acid. The solution on evaporation leaves crystals of what was formerly called the sesquichloride of aluminum in combination with three molecules of water. The atomic weight of aluminum having been doubled by agreement of advanced chemists, the sesquichloride becomes the trichloride of aluminum. The hydrated compound has all the virtues of the chloride of zinc without any of its dangerous qualities. It arrests decomposition and destroys disease germs, and still is not injurious or dangerous when applied as a wash for the body or a gargle in cases of sore throat, diptheria, whooping-cough, or scarlet fever. It has a sweetish astringent or aluminous taste. Its virtues are derived from the chlorine contained in it, being more highly charged with that element than common salt. It has been successfully used as an antiseptic and in the preservation of food.

The PRESIDENT remarked that the preceding item was one of great importance as this substance might take the place of the poisonous substances now in use.

Mr. CHARLES T. PORTER then read a paper upon the action of the Reciprocating parts of steam engines, and its influence on the problem of High Piston Speed, which we give in another column.

The PRESIDENT remarked that locomotives had always run at a high rate of piston speeds and yet in a very smooth and comparatively economical way.

Mr. BLANCHARD said he thought this a very ingenious piece of nonsense, and pledged himself to make this apparent to the Polytechnic branch at a future time. He did not think the gentleman who sat in front of him (Mr. EMERY) believed it either. He said the gentleman had shown the ratio between something and nothing, which was absurd, he thought.

Mr. ROOT—I think the gentleman last up had better study the subject a little. There is no doubt whatever of the truth of the proposition. The inertia of the parts should be sufficient to take up the power of the steam at the beginning of the stroke and give it off at the close. I have built many short-stroke engines and find they run smoothest when the parts are the heaviest. It is possible to get a heavy loss in an engine with light reciprocating parts simply by the use of a heavy fly-wheel.

Mr. FISHER asked the effect of a very heavy piston combined with a short cut off.

Mr. PORTER said that in such a case the piston may be considered as a projectile. Take a very heavy piston as an extreme case, say one whose inertia would be one thousand pounds to the square inch, and use steam at one hundred pounds to the square inch, the action of the fly-wheel, in such a case, would be reversed. An engine could not be made to stand the blow if the reciprocating parts were without weight. Between the extremes of enormously heavy reciprocating parts and reciprocating parts without weight, we have a mean which can be reached, and at which our engines can be made to perform perfectly.

The PRESIDENT asked if the weights were properly proportioned for a slow motion, would they run at any speed ?

Mr. PORTER replied that they would not run as well.

The PRESIDENT remarked that millions of dollars had been spent in this country upon rotary engines. He thought he was within bounds if he said ten million dollars had been spent on them. It is now shown that they are not needed.

Mr. EMERY said that the gentleman who referred to him was entirely mistaken. There is no doubt in regard to the facts enunciated in the paper just read. I think Mr. PORTER is deserving of many thanks for the clear manner in which he has explained the matter. There is more power absorbed at the beginning of the stroke than at any other part. There is an inert mass to be put in motion. This inertia is overcome by the highest pressure of the steam.

The gentleman then drew an indicator diagram upon the board, illustrating the pressure of steam upon the pistons, showing the rapid fall of the pressure from one end of the stroke to the other. Upon this diagram another was drawn in dotted lines, showing how the inertia of the reciprocating parts stored up the force of the steam, giving it out after the half stroke has been reached. He then said that by a proper proportion of the parts he thought it would be possible to make the pressure upon the crank pin so uniform that it would be represented by a straight line, or one very nearly straight. the indicator diagram remaining the same in each case. Locomotives have been run for years at high piston speeds. The reciprocating parts were not as heavy as the theory would indicate, but by means of early exhaust, considerable cushioning, and moderately heavy weights, they had reached nearly the same results. He wanted to know how we were to reach the high piston speeds—whether by the means used by locomotive engineers, or in the way proposed by Mr. PORTER, or by a combination of the two. It was a question, however, which must be left to those who had studied the matter.

Mr. ROOT—The principle Mr. PORTER has explained is an exceedingly important one to short-stroke engines. I have found in my experience in building engines of this class that with heavy moving parts they work very easily. He then mentioned the fact that sometimes with light parts this could not be done.

Mr. FISHER—Undoubtedly Mr. PORTER's system is very important. By means of it it becomes possible to correct the inequalities which arise from cutting off short.

Dr. BRADLEY (?) then presented and described a very curious Japanese clock. It was so arranged that the hours were made longer and shorter according to the length of the day. It must be wound every morning at sunrise. The day was divided into six and the night into six parts.

The Characteristics of Lodes.

[From the Report of the U. S. Commissioner of Mining Statistics].

[Continuation.]

THE effect of the foregoing considerations should be to discourage all mere theorizing as a basis for practice, and to encourage the most minute and careful study of local occurrences. The absence of accurate surveys, working maps, and detailed records of operations, in most American mines, even the best and oldest, has led to great waste of money already, and, if it continues, will be still more disastrously felt hereafter.

I cannot undertake, in the limits of this introductory chapter, to discuss at length the different theories of the formation, modification, and filling of fissures. It must suffice to enumerate the most prominent, and perhaps to indicate their relative importance. One of the most comprehensive and trustworthy works on the subject* has just been translated and republished in this country ; and I recommend its careful study to all persons who desire to obtain rational views concerning a matter so much befogged with crude speculations.

The most universal cause of fissures is doubtless plutonic agency, upheaving portions of the solid crust. This is indicated by the fact that veins are most numerous in mountainous regions. The German term for a mine is bergwerk, or mountain work. Again, it is very common to find masses of eruptive rock in the neighborhood of ore veins ; and although these masses can but rarely be supposed to have directly brought the metallic material into the veins, it is natural to conclude that their occurrence is connected with the disturbances which formed the fissures. Under plutonic agency must, however, in this sense, be included all subterranean disturbances—depressions as well as upheavals, and flexures and latitudinal compressions of strata as well as direct fractures. These may be indirect and slow consequences of changes in the solid crust. It is not necessary to believe that fissures are always formed by sudden convulsions. Indeed, modern geologists are inclined to ascribe many appearances which seem at first glance to result from violent action to slow and long continued processes. The strata of coal and rock in coal mines have been observed to become contorted and fractured in a few years by the simple removal of supporting masses from below.†

Fissures may also be formed by the contraction of rocks in cooling ; but the importance of this agency has probably been over-estimated, so far as metalliferous veins are concerned. Many crystalline rocks have been reckoned as igneous, or supposed to have been subjected to a degree of heat rendering them semi-fluid, which are now quite generally admitted to have been metamorphosed by less violent agency. The fissures formed by cooling in unmistakably eruptive rocks, are, on the other hand, generally unlike those of metalliferous veins. During the past two years I have had opportunity to study this class of phenomenon throughout the vast regions of California, Oregon, and Idaho, which are covered with basaltic overflows ; and I cannot see how the process of contraction could, in any case produce long, regular and deep-seated fissures. The cooling and crystallization of basalt seems to take place around central points or lines. Possibly the first tendency is to the formation of cylindrical masses ; and these are finally fixed in irregular prisms (principally hexagonal) by the weight and tension of the whole mass. The formation of the round cell of the bee, and its subsequent adaptation by pressure to the hexagonal form, would be a parallel case. At all events the process of cooling cannot be uniform over a large surface, and especially not at different depths. Fissures formed in this way, therefore, would not be persistent in direction, nor would they extend in depth below the stratum, the whole of which was at one time cooling. Gash-veins, which do not extend below the stratum in which they are found, are therefore more likely than any others to be the result of such a process ; but even these, I conceive, are far more frequently produced by bending of the strata, and consequent fracture of the layers under the heaviest strata.

The theory of Fox, promulgated some thirty years ago, ascribes the formation of fissures to electrical currents. Experiments showed that by means of artificial currents, fissures could be produced in clay, and also filled with metalliferous deposits. One deduction from this theory was the assertion that all metalliferous veins ought to cross the magnetic meridian at right angles. The fact that veins do not behave as they "ought," in this respect, would of itself overthrow this generalization ; but it is also completely disproved by modern investigations of terrestrial magnetism and electricity. Galvanic currents between dissimilar rocks, constituting natural voltaic piles, pay no particular respect to the magnetic meridian ; and all such agencies, though possibly universally active, are too dependent upon the minute local conditions, and too certain to be locally disturbed, to produce wide uniform results. Galvanic action in veins, *after the deposition of the metalliferous matter*, is probably very important ; but the direct effect of galvanism or electricity or terrestrial magnetism in forming or in filling fissures is probably insignificant.

Finally, fissures may be formed by surface agencies, such as frost, running water, glaciers, (combining both,) the penetrating roots of plants, (following and assisting the former,) and consequent land-slides, etc. I have seen a fissure several hundred feet in depth, caused by the settling of the outer edge of a rock-bluff, at the base of which a river had gnawed away the supporting strata. Innumerable gulches, cañons, ravines, and valleys, and the partly subterranean courses of springs, are to be ascribed in whole or in part to surface agencies. But these are seldom filled with minerals ; and there is no great danger of their being confounded with fissures of subterranean origin.

The strongest analogies lead us to believe that the fissures of most ore veins were formed by plutonic agencies, and, indeed, that many of them are literally the products of earthquakes. Fortunately for science, though unfortunately for the comfort and safety of men, the occurrence of earthquakes in many mining districts has furnished us with many illustrations of this theory ; and I venture to predict that California, Nevada, and Oregon, when more thoroughly studied, will afford abundant new materials for a complete understanding of the subject.

It should be remarked that the formation of fissures in this manner by no means necessitates their extension to the surface. Probably the greater number of fissures do not at first break through to the air, but are afterwards exposed by denudation of the over-lying crust. The occurrence of "blind veins" is familiar to miners. Other fissures, again, may have been covered with alluvial deposits, so as to be perhaps forever hidden from the eyes of men. There is, I think, reason to believe that the volcanic regions of Mexico extended into Louisiana, where they are now covered with tertiary formations.

The depth of fissures I have already mentioned. There is no well-authenticated case on record in which the absolute bottom of a vein has been found by mining. That they reach through the solid crust is strongly indicated by the frequent instances of latitudinal movement in the country-rock. But, as COTTA acutely remarks, the thickness of the solid crust is, locally and temporarily, much reduced in the neighborhood of volcanic eruptions. Moreover, the movements of the country-rock may be caused, to some extent, by the formation of new fissures. Certainly we can scarcely assume that fissures are, in general, deeper than they are long ; but the horizontal length of a fissure, or chain of fissures, may far exceed that of its apparent outcrop. It is not likely that mining will ever be carried on to a greater depth below the surface than four thousand feet.* Economical, if not mechanical, difficulties will decisively interfere. As single fissures have been traced for twenty miles upon the surface, and systems, of probably connected fissures (such as the mother lode of California), for much greater distances, we have no reason to believe that human explorations will reach their limit in depth.

Branches or spurs, and "horses" or masses of the country-rock in fissures, are characteristic features, and serve in many doubtful cases to distinguish between veins and beds. As a bed is always a member of the formation, younger than the underlying, and older than the overlying members, it could not, of course, be attended with arms or branches penetrating the later rocks, since these did not exist while it was forming.

"Heaves," "slides," "throws," "faults," etc., which are movements of the inclosing rocks, generally along the lines of later fissures, are frequently observed in connection with veins ; but it is a mistake to suppose that a sheet-deposit, thus dislocated, is necessarily, therefore, a vein. It is the observation, not the occurrence, which is, perhaps, more common with veins than with beds.† A little reflection will show that such a movement, if it cuts a vein in two, and "heaves" one part sidewise, more or less, from the other, must produce the same effect on the rock-beds of either wall. The cross-course, or line of the dislocation, must be a fissure, but the body dislocated may be a deposit of any class.

It is a practical problem of much importance, to find in the cheapest and most expeditious manner the continuation of a vein which has been cut off by a slide or heave. The observations and calculations involved are frequently delicate and difficult ; nevertheless, the alternative usually adopted in this country, of going blindly into the barren rock, and trusting to luck, is without excuse. I could give several instances within my own knowledge, in which promising enterprises have been ruined by occurrences of this kind, for the want of careful surveys and intelligent reasoning on the part of engineers. The lack of such surveys in the mines of Lander Hill, Reese River, for instance, has produced great loss, and even at the present day, the great and costly experience obtained in many different mines of that locality is almost worthless for future guidance, and is fast being forgotten. The terms "fault" and "disloca-

* Cotta's Erzlagerstättenlehre (A Treatise on Ore Deposits), by BERNHARD VON COTTA, Professor of Geology in the Royal School of Mines, Freiburg, Saxony. Translated by FREDERICK PRIME, JR., Mining Engineer, and revised by the author. New York, 1870.

† Sir CHARLES LYELL.

* Apparent exceptions by tunnels in mountain ranges might occur, but they do not affect the general force of this proposition.

† Even this I doubt. Coal-seams alone present faults and dislocations as abundantly as any veins.

tion" are general in their application, signifying the removal of one portion of an intersected bed or vein from the other, so that the continuance of the deposit beyond the dislocating line is no longer in the extension of the same plane. Heaves are faults in which the hanging wall of the cross-fissure seems to have been lifted; slides, on the contrary, present the appearance of a downward movement of the hanging wall of the cross-fissure. As, in both cases, the fault is produced by a movement of comparatively large masses of rock, it is evident that the extent of dislocation, depending on the amount of motion and the angle of the two fissures, must be the same for all parallel veins faulted by the same cross-fissure. Even when the faulted veins are not parallel, if the fault is the same, its extent can be mathematically calculated from one known case to another not yet explored. In entirely new districts, it is more difficult to infer the extent and direction of dislocations, though careful observation will generally give some clue. The complication of the matter by oblique movements, compound fractures, successive dislocations, etc., is so great, that it cannot be discussed without diagrams and models, nor thoroughly taught without field practice. I venture to lay down one or two rules, which are not without exceptions, but will serve to assist the practical miner in the necessary local investigations.

1. Whatever be the irregularity of the faulted lode, the faulting fissure is generally found to be a pretty regular plane, especially if the dislocation exceeds a few feet. When the faulting fissure has itself gone through the processes of vein-formation, and become a mineral-vein of considerable width, this is less likely to be the case; but ordinary clay-seams, cleanly cutting off veins, and dislocating the two parts, are likely to be quite regular. Hence, when their strike and dip have been carefully determined, the places where they will cut other neighboring veins, or the same veins in different depths, may be approximately calculated.

2. In such cases, a slide is rather to be expected than a heave; that is, the hanging wall of the cross-fissure is more likely to occupy a position lower than its original position, than the reverse. The proofs are two, theoretical and practical. Theoretically, the most probable causes of movement of either wall would be the weight of the hanging wall, and the upward force which may have caused the fissure. The first would move the hanging wall down, and the second would push the foot-wall up, producing the same relative effect.*

3. The continuation of a faulted vein is therefore most naturally (in the absence of more decisive indications) to be sought on that side on which the vein makes an obtuse angle with the cross-fissure.†

4. In searching for the continuation of a faulted vein, when the movement was greater than a few feet, it is better to run a cross-cut, or sink a winze, than to follow the cross-fissure, since the latter is frequently filled with clay or breccia, and almost always so altered and decomposed by water, etc., that the vein may be passed by, and not recognized. A cross-cut will pierce the continuation of the vein if the fault is a slide; and a winze is more likely to be successful in case of a heave.

These suggestions do not cover all cases, but only those most frequently occurring in our faulted gold and silver deposits. For further information, the professional books must be consulted.‡

Double veins, or those in which, subsequent to the first filling, a new disruption, mainly in the plane of the first fissure, has taken place, and a new vein-material, *imperium in imperio*, has been deposited, require no further explanation. Where they occur, it is often noticed that one vein is richer than the other; and the rich zone sometimes jumps from one wall of the double vein to the other—a result of the irregularity of the second fissure. Let any one try to break apart along the original line of fracture two pieces of wood, well glued together, and he will find that the new fissure will not follow the old one.

Slickensides, or polished surfaces in the vein-matter, or along the walls, are produced by small movements of rock-masses, rubbing on one another, with water and sand or clay between. Exactly the same process may be seen at any marble-yard.

Striations may often be seen on the walls, where a movement has taken place. They are produced by sharp points or crystals, resisting the general polishing. Often a study of them will show the direction of the movement—an important fact for the miner. The theory that the richest ore-deposits lie in the veins always parallel with these striations is supported by a few local observations, which I regard as mere coincidences.

[To be continued.]

Pennsylvania Geological Survey.

GOVERNOR GEARY, in his recent message to the Legislature of Pennsylvania, thus alludes to the importance of an accurate and reliable survey of the State: "A reliable geological and mineralogical survey would be of incalculable value to the State. Without it we have indefinite ideas of our vast undeveloped mineral wealth, and the expense attending it would be utterly insignificant when compared with the beneficial results. We are at present without even a reliable map to indicate the locality, character and resources of our mineral regions; and as good maps are the basis of all useful research in every department of science and the arts—especially in the practical sciences of geology and metallurgy—the first step towards a geological survey is to obtain as correct a map as possible, if not of the entire State, at least of such parts thereof as are of the most importance to be studied geologically. This will be a work of labor and time, and can only be accomplished successfully by triangulating each county separately, and from the county maps thus acquired, constructing a complete and accurate map of the whole State. It is neither wise nor just policy to delay this work because it may be more perfectly effected at some future time. There is for it a present necessity, and the time never will come when such a work can be rendered perfect. There can be no such thing as a final geological report. New developments in mineral resources, as well as additional acquirements in scientific knowledge, will constantly be made as long as the world exists.

"The general voice of the business community and land ownership of the State demands this survey. It is especially called for by the oil regions, newly-discovered coal fields, and by the iron, manufacturing and railroad interests. Large portions of the State remain, to a great extent, unstudied by scientific and practical men. The old survey of 1836-41 did a good work, but it is of little value now, except in a few localities. Since it was made, wonderful discoveries have taken place, and problems of structure and deposit still remain unsolved, doubtless involving many millions of dollars in value. Then, many of the back counties were comparatively unsettled, and scarcely any openings were made in our mineral districts, except in the anthracite coal basins and around Pittsburg. Now, the State is full of trial shafts and private explorations; extensive forests have been cleared; roads penetrate what were inaccessible regions; railways traverse whole counties with instrumental field work; many thousands of oil and salt wells have been bored; valuable mines put in working order; the population has advanced in intelligence and grown more observant and enterprising, and the skill of the geologist, metallurgist and surveyor has reached a higher degree of perfection.

"Posterity has its claims upon us; and it should be considered that whatever is done for the present generation, is so much accomplished for the generation that may follow. One important function of a geological survey is to preserve knowledge for future use. Science is cumulative, and its advances are slow. It must collect many facts before it arrives at true conclusions. For want of a proper bureau of statistics, and a corps of observation and publication to collate and relate the facts of our geology and mineralogy as they have appeared, the State has already suffered severely. Much valuable information has been lost, never to be recovered; and but little certain knowledge of past mining and other scientific operations has been preserved, to govern and assist the future engineer. The sooner, therefore, in my opinion, a geological survey is authorized, the better will it be for the prospective interests of the State, as well as for its present necessities."

* In rare instances, the cross-fissure is vertical, and this distinction cannot be observed.

† This rule applies to slides only. Heaves follow the exact opposite.

‡ See Cotta's ore deposits, and especially Lottner's Bergdaukkunde, Berlin, 1869, Bd, I. S. 32-44

OFFICIAL LIST OF PATENTS.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JANUARY 17, 1871.—Continued.

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On an application for Design (seven years)	10
On an application for Design (fourteen years)	30
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111,061.—CRUSHING AND HULLING ATTACHMENT TO GRINDING-MILLS.—George C. Hohenstein and Charles T. Glaeser, Cincinnati, Ohio.

111,062.—COMBINED SEED-DRILL, MANURER, AND POTATO-DIGGER.—Eugene C. Hopping and Eugene A. Ely, Madison, N. J.

111,063.—BEAM OR GIRDER FOR FIRE-PROOF STRUCTURES.—William Wesley Hughes, Philadelphia, Pa.

111,064.—APPARATUS FOR SEPARATING OIL FROM GRAIN AND OTHER MATERIALS.—Elias S. Hutchinson, Baltimore, Md.

111,065.—FEED-CUTTER.—Christoph Kemper, Hermann, Mo.

111,066.—MODE OF MAKING BRICKS.—Francois Lambert, Los Angeles, Cal.

111,067.—COMBINED STEAMER AND CONDENSER.—George W. Lane, Portland, Me., assignor to himself and John Alles, Boston, Mass.

111,068.—OILER.—Albert D. Laws, Bridgeport, Conn.

111,069.—GRAIN-BINDER.—Sylvanus D. Locke, Janesville, Wis.

111,070.—HUB FOR VEHICLES.—William I. Lyman, East Hampton, Mass.

111,071.—EMBROIDERY ATTACHMENT FOR SEWING-MACHINES.—William A. Mack, Norwalk, Ohio.

111,072.—LAMP.—Rufus S. Merrill, Boston, Mass., assignor to himself, William B. Merrill, and Joshua Merrill, same place.

111,073.—LAMP-CHIMNEY.—Rufus S. Merril, Boston, Mass., assignor to himself, William B. Merrill, and Joshua Merrill, same place.

111,074.—LAMP-BURNER.—Rufus S. Merrill, Boston, Mass., assignor to himself, William B. Merrill, and Joshua Merrill, same place.

111,075.—MANUFACTURE OF SAFETY-MATCHES.—L. Otto P. Meyer, Newtown, Conn.

111,076.—BRICK-PRESS.—James Allaire Millholland, Mount Savage, Md.

111,077.—WATER-WHEEL.—Albert L. Moore and Norman S. Parker, El Dorado, Oregon.

111,078.—TILE-MACHINE.—Albert Moorhous, Indianapolis, Ind.

111,079.—HAT-MACHINE.—Charles M. Osgood, Amherst, Mass., assignor to L. M. Hills & Son, New York City.

111,080.—WINDOW FRAME.—Silas R. Owen, Stewartsville, Mo.

111,081.—MACHINE FOR THE MANUFACTURE OF PAPER CARPET-LININGS.—Claudius A. Pease, Astoria, N. Y.

111,082.—MACHINE FOR MAKING BOLTS AND NUTS.—George Richard Postlethwaite, Birmingham, Great Britain.

111,083.—TRACK-CLEANER FOR MOWING-MACHINES.—Benjamin F. Power, McConnellsville, Ohio, assignor to Hugh M. Cochran and Joseph F. Sonnanstine.

111,084.—TABLE FOR DRILLING-MACHINES.—Thomas Reaney, Chester, Pa.

111,085.—REAMING AND COUNTERSINKING-TOOLS.—Thomas Reaney, Chester, Pa.

111,086.—MATTING APPARATUS.—James H. Reilly, Brooklyn, N. Y., assignor to Henry G. Boed, Taunton, Mass.

111,087.—HOT-AIR FURNACE.—Alexander K. Rider, New York, N. Y., assignor to himself, Cornelius H. Delamater, and George H. Reynolds, same place.

111,088.—AIR-ENGINE.—Alexander K. Rider, New York, N. Y., assignor to himself, Cornelius H. Delamater, and George H. Reynolds, same place.

111,089, antedated January 7, 1871.—CIGAR-FILLING.—Socrates Scholfield, Providence, R. I.

111,090.—FENCE.—Wesley W. Sherman, St. Charles County, Mo.

111,091.—COLLAPSING CORE-BARREL.—William Smith, Pittsburg, Pa.

111,092.—MACHINE FOR SINKING SCREW-PILES.—William Sooy Smith and William Reuschel, Chicago, Ill.; said Reuschel assigns his right to said Smith.

111,093.—EDGING-MACHINE.—Edward H. Stearns, Erie, Pa.

111,094.—EXTENSION-SCAFFOLD.—Asel Sweet, Westfield, Pa., assignor of one-half his right to George W. Crisholm, same place.

111,095.—LUBRICATOR FOR AXLES.—Henry Thurlow, Skaneateles, N. Y.

111,096, antedated January 6, 1871.—RAILROAD-SPIKE.—Henry Fostrick, New York, and Reinhold Boeklen, Brooklyn, N. Y.

111,097.—MANUFACTURE OF ORNAMENTAL BARS OR RODS OF METAL.—Stephen Tuddenam, Lower Marsh, Lambeth, England.

111,098.—WAGON-JACK.—George H. Tule, Haddonfield, N. J., assignor to himself and Samuel Wood, same place.

111,099.—AUGER.—Blase Walch, Frederick, Md.

111,100.—MANUFACTURE OF ARTIFICIAL LEATHER.—Frederick Walton, Staines, England.

111,101.—PLANTER AND CULTIVATOR.—A. Quarles Withers, Holly Springs, Miss.

LIST OE PATENTS FOR THE WEEK—JANUARY 24.

111,102.—CHARGER FOR SHOT-POUCHES.—Thomas W. Allen, Waterbury, Conn.

111,103.—CHILDREN'S CARRIAGE.—Rodney C. Britton, Springfield, Vt.

111,104.—BAGGAGE-TRUCK.—William Hammond Brown, Bangor, Me.

111,105.—AUTOMATIC LUBRICATING CUP.—James A. Bryan and William Stainfield, Kent, Ohio.

111,106.—PRUNING-SHEARS.—John Calder, Macedon, N. Y.

111,107.—BEE-HIVE.—Albert Claypool, Weston, Ohio.

111,108.—PARLOR BEDSTEAD.—Francis E. Coffin, Boston, Mass.

111,109.—SLEIGH-BRAKE.—Eustace J. Cooper, Mineral Point, Wis.

111,110.—STEAM LUBRICATOR.—Daniel Currie, Belleville, Ill.

111,111.—TYPE-CASPING MACHINE.—William Wallace Dunn, San Francisco, Cal.

111,112.—GOVERNOR FOR ELECTRO-MOTORS.—Thomas A. Edison, Newark, N. J., assignor to himself, Elisha W. Andrews, George B. Field, and Marshall Lefferts, New York, N. Y.

111,113.—MACHINE FOR CUTTING PAPER COLLARS.—Alfred L. Elliot, Boston, rssignor to himself and Edwin A. Eaton, Winchester, Mass.

111,114.—FLUX FOR WELDING STEEL OF HIGH AND LOW GRADES.—John Farrel, New York, N. Y.

111,115, antedated January 13, 1871.—TRUSS.—Alexander Folleau, San Francisco, Cal.

111,116.—STEAM-BOILER FEEDER.—Lucas Foote, North Fairfield, Ohio.

111,117, antedated January 7, 1871.—BURIAL CASE.—Patrick H. Griffin, Albany, N. Y.

111,118.—THILL-COUPLING.—Collins W. Griffith, Cincinnati, Ohio, assignor to himself and Charles H. Mackintosh, Strathroy, Canada.

111,119.—BACK PAD PRESS.—Edwin W. Harlow, Hastings, Mich.

111,120.—PUMP.—Patrick Harxey, Chicago, Ill.

111,121.—EVAPORATOR.—Richard Hawley, Jr., Busnell, Ill.

111,122.—FEED-TROUGH GUARD.—Edwin Hovenden, Bushnell, Ill.

111,123.—RAILWAY CAR COUPLING.—Lewis Huddle and Jacob K. Huddle, Tiffin, Ohio.

111,124.—GATE.—Robert Henry Hudgin, Fairfield, Canada.

111,125.—HARROW AND CULTIVATOR.—James F. Jaquess, Commerce, Mich.

111,126.—ASH SCREEN.—Edward C. Jenkins, Jr., Worcester, Mass.

111,127.—CAR SPRING.—James Leland, Springfield, Mass.

111,128.—METHOD OF SECURING JOINTS OF FRAMES, &c.—Charles F. Linscptt, New York, N. Y., assignor to Edward S. Torrey and Joseph Torrey, same place.

111,129.—SEWING-MACHINE.—T. A. Macaulay, New York, N. Y.

111,130.—GATHERING ATTACHMENT FOR SEWING-MACHINES.—William A. Mack, Norwalk, Ohio.

111,131.—SEWING-MACHINE.—James D. Matthews, Niles, Mich.

111,132.—GRAIN-DRILL.—Daniel E. McSherry, Dayton, Ohio.

111,133.—COMPOUND FOR PRESERVING DRAIN-TILES, BRICKS, &c.—Edward Milner, Marquette, Mich., assignor to Charles H. Mackintosh, Strathroy, Canada.

111,134.—METER.—Charles Moore, New York, N. Y., assignor to Fose F. De Navarro, same place.

111,135.—CHAIR CLAMP FOR RAILWAY CARS.—William Morehouse, Buffalo, N. Y.

111,136.—MACHINE FOR UPSETTING IRON.—Martin L. Munger and Corodon D. W. Gibson, Grand Blank, Mich.

111,137.—BOOT-STRETCHER.—Isaac M. Myers, San Francisco, Cal.

111,138.—HAY RACK.—Francis Louis Nagler, Irving Township, Mich.

111,139.—CORN-SHELLER.—Franklin Nelson, Wyandotte, Mich., assignor to himself and Joseph Maseth, same place.

111,140.—CLAMP FOR CARRIAGE SEATS.—Henry J. Northrup, Lansinburg, N. Y.

111,141.—MACHINE FOR PRESSING FABRICS.—George H. Nussey and William B. Leacham, Leeds, England.

111,142, antedated December 29, 1870.—OBTAINING MADDER EXTRACTS.—Alfred Paraf, New York, N. Y., assignor to Edward Sabine Renwick, trustee, same place.

111,143.—WATER-METER.—Webster Park, Norwich, Conn.

111,144.—ANCHOR.—Gurney C. Pattison, Baltimore, Md.

111,145.—ANCHOR.—Gurney C. Pattison, Baltimore, Md.

111,146.—TUBE EXTRACTOR.—Isaac H. Peters, Marshall, Mich.

111,147.—MACHINE FOR GRINDING HAND SAWS.—Edwin S. Piper, Rochester, N. Y.

111,148, antedated January 7, 1871.—COMPOUND FOR COATING WOODEN STRUCTURES TO PROTECT THEM AGAINST FIRE.—Anthony Pirz, Long Island City, N. Y., assignor to himself and Henry Torstrick.

111,149.—TOY CARRIAGE.—Frederick W. Porter, Springfield, Vt.

111,150.—HORSE HAY RAKE.—Samuel Rockafellow, Moline, Ill.

111,151.—ASPHALTIC PAVEMENT.—Samuel R. Scharf, Baltimore, Md., assignor to himself and Hugh M. Funston, New York.

111,152.—COUPLING FOR SHAFTINGS.—Scott A. Smith, Philadelphia, Pa., assignor to Cresson & Smith, same place.

111,153.—SIZING-MACHINE.—Albert H. Sturgis, Lewiston, Me., assignor to himself and Joseph A. Pierce, same place.

111,154.—FURNACE FOR STEAM-BOILERS.—Morse K. Taylor, United States Army.

111,155.—MANURE RAKE ATTACHMENT FOR PLOWS.—Marinus Van Duine and Jan De Jonge, Zeeland, Mich.

111,156.—COFFER-DAM.—John E. Walsh, New York, N. Y.

111,157.—COFFER-DAM.—John E. Walsh, New York, N. Y.

111,158.—PLOW-COLTER.—Seth Way, La Porte, Ind.

111,159.—STEAM-GENERATOR.—Samuel West, Elmwood, Ill., assignor to Elmwood Mining and Manufacturing Company, same place.

111,160.—SERVING-REEL.—Joseph Henry Westcott, Medford, Mass.

111,161, antedated January 12, 1871.—MOP-HEADS.—Henry H. Wetmore, Barre, Vt.

111,162.—WINDOW-PROTECTOR.—William K. Winant, Rye, N. Y., assignor to himself, William Wilmot Kissam, and Emily Winant.

111,163.—GRAIN-DRIER.—Levi Abbott, Lewiston, Me., and Joseph A. Sherburne, Boston, assignors to themselves and Earl W. Johnson, Boston, Mass.

111,164.—SAW.—Emanuel Andrews, Williamsport, Pa.

111,165, antedated January 14, 1871.—EARTH-SCRAPER.—Asher S. Babbit, Keeseville, N. Y., assignor to Babbit, Hinckley & Co., same place.

111,166.—CONCRETE FOR PIPES, TUBES, BUILDINGS, &c.—Thomas J. Barron, Brooklyn, E. D., N. Y.
111,167.—HOLLOW AUGER.—Aaron Bauman and Orin O. Witherell, Toledo, Ohio.
111,168.—ATMOSPHERIC] PRESSURE ATTACHMENT FOR DENTAL PLATES.—John H. Beers, San Francisco, Cal.
111,169.—LIQUID-COMPASS.—John Bliss and George H. Bliss, Brooklyn, N. Y.
111,170.—CAR-COUPLING.—Joseph Boothroyd, Michigan City, Ind.
111,171.—COAL BOX.—Timothy L. Bozart, Jr., Indianapolis, Ind.
111,172.—RAILWAY CAR TRUCK.—Louis D. Boyce and George H. Jones, Rochester, N. Y.
111,173.—COLLAPSING CORES.—Anthony T. Brodie and Robert R. Smith, Pittsburg, Pa.
111,174.—GAS GENERATOR.—John Butler, New York, N. Y.
111,175.—APPARATUS FOR CARBURETING AIR.—Henry Albert Chapin, New York, N. Y.
111,176.—SCOURING, WASHING, AND WRINGING-MACHINE.—William H. Churchman, Indianapolis, Ind.
111,177.—DIE FOR MAKING FELLY PLATES.—Allison N. Clark, Plainville, Conn.
111,178.—HAT.—James W. Corey, Newark, N. J.
111,179.—FLUID METER.—Robert Creuzbaur, Williamsburg, N. Y.
111,180.—VARIABLE CUT-OFF FOR STEAM ENGINES.—William B. Cross, Sacramento, Cal.
111,181.—SPOKE-TENONING MACHINE.—Godfrey E. Culp and Matthew Flaig, Lockhaven, Pa.
111,182.—FURNACE FOR BURNING SMALL COAL OR CULM.—Alfred Dart, Carbondale, Pa.
111,183.—WINE-PRESS.—George L. Davenport and Charles G. Case, Davenport, Iowa.
111,184.—REMOVABLE CAR-SEAT BACKS.—Peter F. Duehemin, Somerville, Mass.
111,185.—TREATING FRUIT TREES TO PREVENT THE RAVAGES OF INSECTS, &c.—Samuel J. Everett, Mahoney City, Cal.
111,186.—TRAY-HOLDER,—Obed Fahnestock, Indianapolis, Ind.
111,187.—PIPE-COUPLING.—John B. Fink, Mechanicsville, Pa.
111,188.—HOISTING APPARATUS.—Henry Flad and James B. Eads, St. Louis, Mo.
111,189, antedated January 14, 1871.—WATER-CLOSET.—Charles Frankish, Chicago, Ill.
111,190.—GATE.—Willard Green Franklin, Shelbina, Mo.
111,191.—STEAM BOILER.—John L. Frisbie, Brooklyn, N. Y., assignor to Marshall T. Davidson, same place.
111,192.—STEAM RADIATOR.—John L. Frisbie, Brooklyn, Brooklyn, N. Y., assignor to Marshall T. Davidson, same place.
111,193.—CASTER.—Francis A. Gardner, Danbury, Conn.
111,194.—PEN-HOLDER.—Alfred M. George, Sand Fly, Texas.
111,195.—MEDICAL COMPOUND FOR THE CURE OF RHEUMATISM.—Rebecca Gilkinson, New York, N. Y.
111,196, antedated January 14, 1871.—SPRING-CATCH FOR DOORS. William Glue, Muskegon, Mich.
111,197.—MACHINE FOR SEWING BOOTS AND SHOES.—Charles Goodyear, New Rochelle, N. Y.
111,198.—COMPOUND FOR REMOVAL OF SCALES FROM STEAM BOILERS.—William Thomas Grant, Neelyville, Ill.
111,199.—BASTER-GUIDE FOR SEWING-MACHINES.—Franklin T. Grimes, Liberty, Mo.
111,200.—CORN-DROPPER.—Jacob H. Gross, Niantic, Ill.
111,201.—GATE.—John K. Harris, Springfield, Ohio.
111,202.—HAND CORN-PLANTER.—James M. Harrison, Spartanburg, Ind.
111,203.—BEER-COOLER.—Carl W. Haug, New York, N. Y., assignor to himself and Henry Bunz, same place.
111,204.—BEE-HIVE.—Henry L. Heckman, Brooklyn, Iowa.
111,205.—COCK.—William H. Hedges and Matthew E. Campfield, Newark, N. J.
111,206.—MACHINE FOR CUTTING AND DRESSING STONE.—Jacob Hedrick, William Tash, and Henry Kreidler, York, Pa.
111,207.—BOX-OPENER.—Thomas B. Henkle, Knightstown, Ind.
111,208.—VEGETABLER-CUTTER.—David Wallace Hersey, Pembroke, Me.
111,209.—FOLDING CHAIR.—Francis Marsh Holmes, Boston, Mass.
111,210.—BRICK-MACHINE.—Erwin C. Hubbard, Green Bay, Wis.
111,211.—RAILWAY CAR WHEEL.—Lewis B. Hunt, New York, N. Y.
111,212.—OPERATING CUTTER FOR STEAM-PLOWS.—Oliver Hyde, Oakland, Cal.
111,213.—ELASTIC TIRE FOR TRACTION ENGINES.—Oliver Hyde, Oakland, Cal.
111,214.—MANUFACTURE OF LEATHER.—Samuel B. Jenks and Frederick A. Holcomb, Grand Rapids, Mich.
111,215.—COMBINED FEED-WATER HEATER AND CIRCULATOR.—Edward L. Jones, Memphis, Tenn.
111,216.—DIE FOR ORNAMENTING SHEET METAL.—Charles Kaufman, Oconomowoc, Wis.
111 217.—POTATO-PLANTER.—Hiram J. Kent, Palmyra, N. Y.
111,218.—DEVICE FOR BENDING WOOD.—Edward Lacey, Chicago, Ill.
111,219.—PUMP.—Geoege H. Laub, West Lebanon, Ind.
111,220.—TOOL FOR CUTTING OFF PIPES IN OIL-WELLS.—James H. Luther, Petroleum Centre, Pa.
111,221.—TOOL FOR CUTTING OFF AUGER STEMS IN OIL WELLS.—James H. Luther, Petroleum Centre, Pa.
111,222.—EMBALMING.—Benjamin F. Lyford, San Francisco, Cal.
111,223.—GRATE BAR.—Joseph T. Marshall, Wilmington, Del.
111,224.—CAR-COUPLING.—John Mayben, Milroy, Pa.
111,225.—STOVE-PIPE SHELF.—James McCallum, Rochester, N. Y., assignor of one-third of his right to Harvey E. Gillam, same place.
111,226, antedated January 18, 1871.—GANG-PLOW.—John R. McConnell, Marengo, Iowa.
111,227.—PUMP.—John H. McGowan, Cincinnati, Ohio.
111,228.—COMBINED GANG-PLOW AND CULTIVATOR.—James A. Medaris, Sullivan, Ind.
111,229.—BRACE FOR CARRIAGE AND OTHER SPRINGS.—Lumon C. Miller, Humphreys, N. Y.
111,230.—FOLDING DESK.—John Milwain, Nashville, Tenn.
111,231.—PORTABLE ESCRITOIR.—Walter G. Mitchell, Holliston, Mass.
111,232.—BUGGY SEAT.—Edward T. Mithoff and Jesse W. Dann, Columbus, Ohio.
111,233.—FLUID METER,—Charles Moore, New York, N. Y., assignor to William Tobin, same place.
111,234.—LIQUID METER.—Charles Moore, New York, N. Y., assignor to William Tobin, same place.
111,235.—MEASURING ATTACHMENT FOR PACKAGED FABRICS.—Edward Morgan, Washington, D. C., assignor of two-thirds of his right to J. F. McKee, Fort Smith, Arkansas, and Charles Fair, Philadelphia, Pa.
111,236.—BODY-LININGS FOR LADIES' DRESSES.—Schamu Moschowitz, New York, N. Y.
111,237.—LAMP.—Rufus Nutting, Randolph, Vt.
111,238.—GATE.—Patrick O'Neill, Murfreesborough, Tenn.
111,239.—BARK-MILL.—Gilbert E. Palen and Florello P. Avery, Tunkhannock, Pa.
111,240.—SPADE.—Harrison Parkman, Philadelphia, Pa.
111,241.—STOP-VALVE.—John Paterson, Troy, N. Y.
111,242.—STOP-VALVE.—John Paterson, Troy, N. Y.
111,243.—DRAWER-PULL.—Cnerles H. Pierpent, West Meriden, Conn., assignor to himself and P. J. Clark, same place.
111,244.—PLOW.—Joseph Pinkham, New Market, N. H.
111,245.—BOOT-CRIMPER.—William Polsgrove, St. Thomas, Pa.
111,246.—CONNECTOR FOR TELEGRAPH WIRES.—George Bartlett Prescott, New York, N. Y.
111,247, antedated January 14, 1871.—PLOW.—Jackson P. Pritchard, Conn Valley, Cal.
111,248.—MACHINE FOR CUTTING SCREW THREADS ON BOLTS.—Salmon W. Putnam, Jr., Fitchburg, Mass.
111 249.—STAIR-ROD FASTENING.—Emil Rath, New York, N. Y., assignor to Moritz Krickl, same place.
111,250.—CULTIVATOR.—William Benjamin Read, Gallatin, Tenn.
111,251.—MACHINERY FOR TRANSMITTING AND DISTRIBUTING MOTIVE POWER.—James Richmond, Lockport, N. Y.
111,252.—HAY-LOADER.—John P. Rideout, Bowdoinham, Me.
111,253.—SETTING STONES, &c.—William Riker, Newark, N. J.
111,254.—CARD FOR MARINERS' LIQUID COMPASSES.—Edward S. S. Ritchie, Brookline, Mass.
111,255, antedated January 18, 1871.—CATTLE-STANCHION.—Joshua A. Rosback, Hermon, N. Y.
111,256.—CULTIVATOR.—H. Murtin Rose, Clinton, Ill.
111,257, antedated January 14, 1871.—BELT-TIGHTENER.—George W. Runk, Franklin, La.
111,258.—MOWING-MACHINE.—George T. Savary, deceased, Newburyport, Mass., N. Jennie Savary, administratrix, assignor to John N. Pike, same place.
111,259.—LATH-MACHINE.—Charles Schleicher, Louisville, Ky.
111,260.—ICE-PICK AND HOOK.—Eide H. Schmults and Jacob Baker, New York, N. Y.
111,261.—RAILWAY SWITCH AND SIGNAL APPARATUS.—Adolph Schnabel and Theodore Henning, Bruchsal, Grand Duchy of Baden.
111,262.—LIQUID-METER.—Henry C. Sergeant, Newark, N. J., assignor to Jose F. De Navarro, New York City.
111,263.—BURIAL-CASE.—Frank B. Shearer, Columbus, Ohio.
111,264.—APPARATUS AND PROCESS FOR CANNING AND PRESERVING MEATS, FRUITS, VEGETABLES, &c.—Nicholas H. Shipley, Baltimore, Md.
111,265.—ROCK-DRILL.—Henry Shoemaker and John Shoemaker, Putneyville, Vt.
111,266.—GATE.—Lyman W. Sibley, Ames, Iowa.
111,267.—PLASTER FOR WALLS.—Benjamin R. Smith and John Campbell Harris, Philadelphia, Pa.
111,268.—LIQUID-METER.—William E. Snediker, New York, N. Y., assignor to Jose F. De Navarro, same place.
111,269.—STEEL GLASS-CUTTER AND KNIFE.—Thelesphore Spenard, Coaticooke, Canada.
111,270.—BOLSTER AND PILLOW.—Timothy S. Sperry, Chicago, Ill.
111,271.—BURIAL-CASKET HANDLE.—Clark Strong, Winsted, Conn.
111,272.—HARVESTER.—Henry Stuckey, Bucyrus, Ohio, assignor to A. C. Shock, same place.
111,273.—BEE-HIVE.—David H. Swartz, Lancaster, Ohio.
111,274.—LAMP-BURNER.—Alvin Taplin, Forestville, assignor to the Bristol Brass and Clock Company, Bristol, Conn.
111,275.—SHUTTLE FOR SEWING-MACHINE.—Eben C. Thaxter, Providence, R. I.
111,276.—SEWING-MACHINE MOTOR.—William C. Thornton and James D. Cooley, Hillsville, Va.
111,277.—MILLSTONE-DRIVER.—John J. Tomlinson, Bozeman City, Montana Territory.
111,278.—LOOM.—Hamilton E. Towle, Newark, N. J.
111,279.—REIN-SUPPORTER.—Ross Townsend, Liberty Township, Ohio.
111,280, antedated January 7, 1871.—ICE-MACHINE.—David K. Tuttle and Orazio Lugo, Baltimore, Md.
111,281.—SALT-CELLAR.—John T. Walker, Brooklyn, N. Y.
111,282.—MILLSTONE BALANCES.—John Walsh, Galena, Ill.
111,283.—BEE-HIVE.—William Wambach, Indianapolis, Ind.
111,284.—NUTMEG-GRATER.—Dewitt C. Warner, Chicago, Ill.
111,285.—ELEVATOR.—John Jacob Weber, St. Clair, Pa.
111,286.—LUBRICATOR FOR RAILWAY CAR AXLES.—Isaac P. Wendell, Philadelphia, Pa., assignor of one-half his right to Stephen P. M. Tasker, same place.
111,287.—LUBRICAOR FOR RAILWAY-CAR AXLE-BOXES.—Isaac P. Wendell, assignor of one-half his right to Stephen P. M. Tasker.
111,288.—GAS-GENERATING AND BLAST-HEATING APPARATUS FOR METALLURGIC AND OTHER PURPOSES.—James D. Whelpley and Jacob J. Storer, Boston, Mass.
111,289.—BEE-HIVE.—Asbury Wilkinson, Greensburg, assignor to himself and William T. Gibson, Indianapolis, Ind.
111,290.—FLOUR-BOLTING REEL.—Allison L. Williams, Orth, Ind.
111,291.—ROACH AND BUG TRAP.—Thomas Williams, Tompkinsville, N. Y.
111,292.—APPARATUS FOR MAKING ICE AND COOLING.—Franz Windhausen, Brunswick, Germany, assignor to Louis Schneider, C. T. Buddecke, and John A. Blaffer, of New Orleans, La.
111,293.—ICE-MACHINE.—Franz Windhausen, Brunswick, Germany, assignor to Louis Schneider, C. T. Buddecke, and John A. Blaffer, New Orleans, La.

REISSUES.

4,237.—CONSTRUCTION OF ELECTRO-MAGNETS.—Henry M. Paine, Newark, N. J., assignor, by mesne assignments, to the Paine Electro-Magnetic Engine Company.—Patent No. 103,231, dated May 17, 1870.
4,238.—RAILWAY CAR TRUCK.—William Pettit, Philadelphia, Pa.—Patent No. 38,980, dated June 23, 1863.
4,239.—COMPOUND TO INCREASE THE FRICTION BETWEEN BELTS AND PULLEYS.—Louis F. Robertson, New York, N. Y.—Patent No. 104,356, dated June 14, 1870.
4,240.—PASSENGER FARE BOX.—John B. Slawson, New York, N. Y.—Patent No. 17,899, dated July 28, 1857; reissue No. 550, dated May 4, 1858.

DESIGNS.

4,588.—HEATING-STOVE.—Nicholas Brayer, Rochester, N. Y., assignor to "Equitable Co-operative Foundry Company," same place.
4,589.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Co., same place.
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4,600.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,601.—CARPET-PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to Leedom, Shaw & Stewart, same place.
4,602.—BOX FOR TOPS OF BUREAUS.—Daniel A. Hall and David Garrison, Philadelphia, Pa., assignors to Swan & Clark, same place.
4,603.—BOX FOR TOPS OF BUREAUS.—Daniel A. Hall and David Garrison, Philadelphia, Pa., assignors to Swan & Clark, same place.
4,604.—SEWING-MACHINE STAND.—Henry Loth, Philadelphia, Pa.
4,605.—FRAME OF SCHOOL DESKS.—Albert E. Roberts, Des Moines, Iowa.
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4,608.—BOX FOR THE TOPS OF BUREAUS.—Baxter C. Swan, Philadelphia, Pa.
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4,610.—BED-QUILT.—Francis C. Van Horn, Camden, N. J.
4,611.—COOKING-STOVE.—Nicholas S. Vedder and Francis Ritchie, Troy, assignors to Russell Wheeler, Utica, N. Y.
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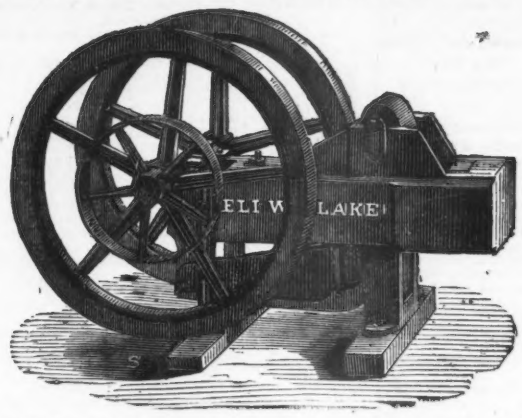

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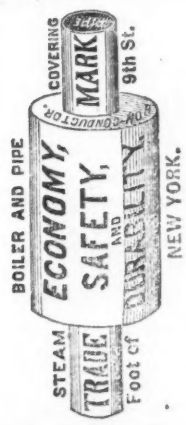

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25	Child's Cup, No. 041	2 75	6	25
26	Knife, Fork, and Spoon, child's set, morocco case	3 00	8	30
27	One dozen Napkin-Rings, medallion	9 00	17	54
28	Tea Set, gold lined, No. 1822	48 00	52	180
29	Tea Set, No. 1866	36 00	45	135
	FROM COLBY BROS. & CO.			
30	Knife-Cleaner	75	2	
	FROM MABIE, TODD & CO.			
31	Gold Pen and Pencil, rubber case	8 00	15	45
32	Gold Pen and Pencil. rubber case	6 75	13	37
33	Gold Pen, silver or gold holder, in box	4 25	9	32
34	Gold Pen, extension gold case, in box	20 00	29	90
35	Lady's Gold Pen, ivory holder, in box	2 75	6	25
	FROM HENRY RUSSELL & CO.			
36	Downer Mineral Oil Lamp, No. 1956	4 75	10	35
37	Downer Mineral Oil Lamp, No. 1963	9 25	17	56
	FROM C. F. A. HEINRICH.			
38	St. Germain Student Lamp, largest size	8 25	15	45
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39	Family Scales	14 00	21	70
	FROM COLBY BROS. & CO.			
40	Clothes-Wringer	7 50	10	35
	FROM ALEXANDER M. LESLEY.			
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42	Cooler, the Newport, No. 1	12 00	15	45
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49	Iron Jointer-Plane, Bailey's patent	10 00	18	58
50	Wood Smoothing-Plane, Bailey's patent	3 00	8	30
51	Wood Fore-plane, Bailey's patent	4 50	10	35
52	Wood Jointer-Plane, Bailey's patent	4 75	12	36
53	Wood Jointer-Plane, Bailey's patent	5 50	14	40
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54	Machinists' Hand-Taps	17 60	25	75
55	Machinists' Hand-Taps	52 80	65	220
56	Machinists' Hand-Taps (your choice)			
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58	Screw-Plates and Dies, size B 1	8 00	15	45
59	Screw-Plates and Dies, size C 1	10 00	18	58
60	Screw-Plates and Dies, size D 1	13 00	20	70
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63	Tap-Wrenches, size C	5 00	12	37
64	Set of 11 Taper Shank-Twist Drills, No. 1	19 75	29	90
65	Set of 29 Drills, straight shank, mounted, No. 9	12 00	18	60
66	Set of 60 Drills, steel wire gauge from 1 to 60, No. 12	8 00	15	45
67	Set of 21 Taper-Shank Drills, No. 3	44 00	58	175
68	Set of 9 Bit-Stock Drills, 1-16 to 3 8 in	2 80	6	25
69	Self-Centering Drill-Chucks, Beach's patent, for jewelers, No. 0	10 00	18	58
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71	Self-Centering Drill-Chucks, Beach's patent, 0 to 3-16, No. 1	6 00	13	38
72	Self-Centering Drill-Chucks, Beach's patent, 1 to 60 S. W. E., No. IX	7 00	14	40
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75	Drill-Grinding Machine, No. 2	20 00	30	95
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" "	*50*	" "	200..	85	" "	
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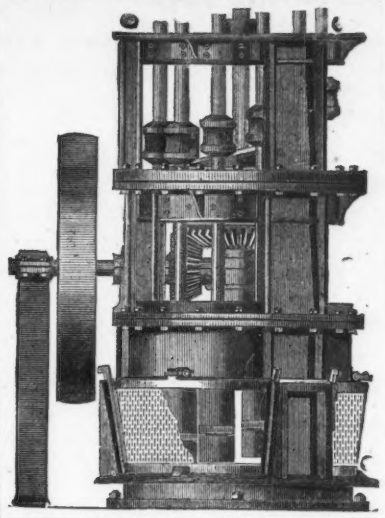

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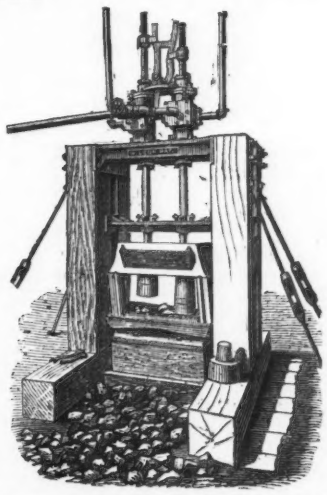

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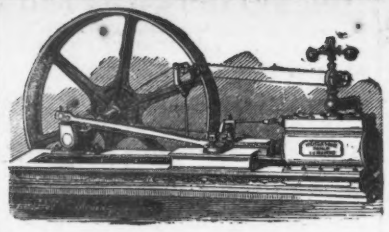

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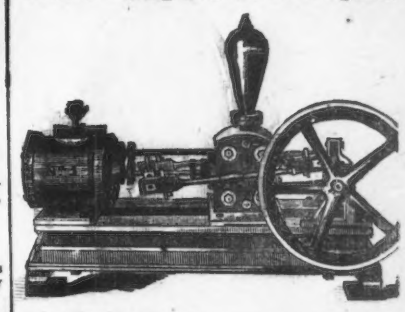

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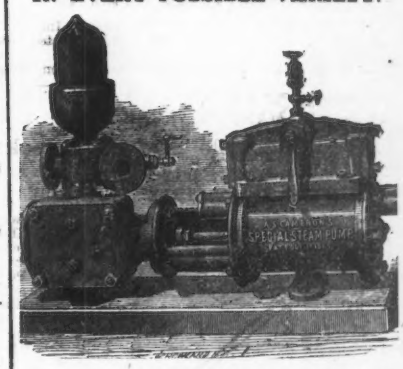

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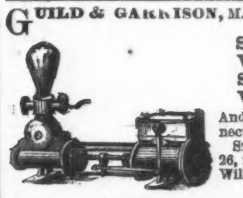

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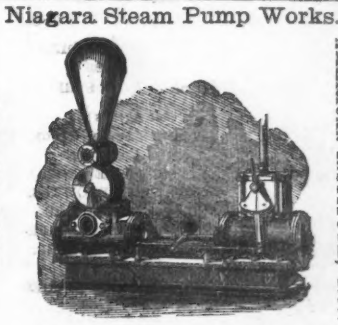

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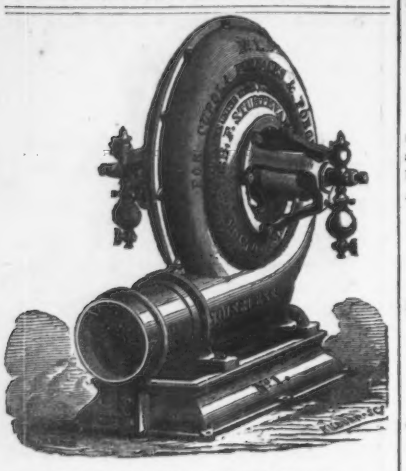

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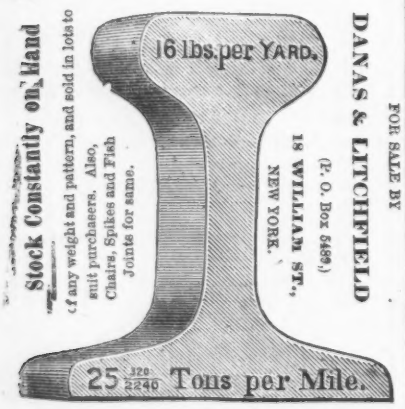

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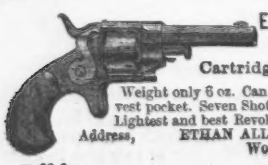

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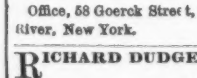

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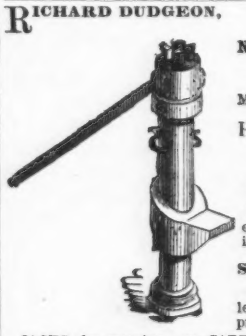

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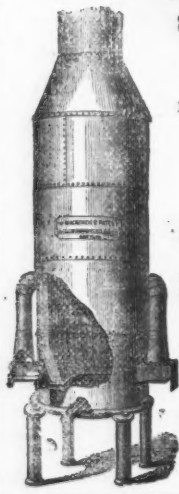

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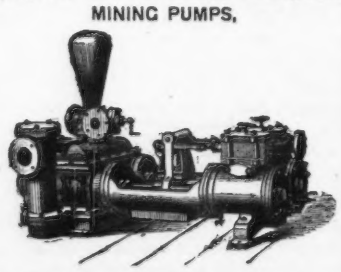

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